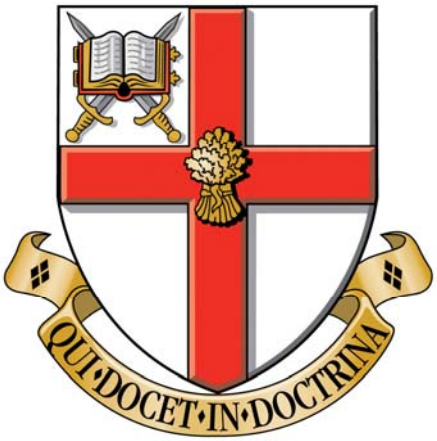

University of Chester

MSc in Public Health Nutrition

Consumers' willingness to trade taste for health, a study of soya milk.

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ABSTRACT

Background: Soy foods are currently receiving significant attention from the food industry and consumers, because of its role as a functional food. However, the acceptance of soy has been slow in western countries because of its poor sensory characteristics, including beany and other off-flavours and aromas. Taste continues to be the primary obstacle to soy food acceptance and mainstream consumers are more reluctant than ever to compromise taste for health benefits.

Objective: The study aims to investigate whether health-orientation, is the driver or motivation behind willingness to compromise on taste in favour of the health benefits of soy products despite their reported poor sensory characteristics. It also aims to: a) explore consumers' willingness to accept soy products; b) determine whether consumer understanding of the diet-health relationship would be an important factor influencing their choice of purchasing and preference for soy products and c) investigate the relationship between consumers' acceptance and consumers' perception of health benefits from consuming soy products.

Methods: Mixed methodology was employed whereby a qualitative approach was used to enhanced the interpretation of a quantitative data:1) Consumer survey – quantitative method, 82 participants 2) Focus groups discussions- qualitative sensory evaluation method, 7 participants.

Results: Consumers are rather sceptical towards the concept of functional foods; their knowledge was uneven and limited. They also view functional foods as an expensive and unnecessary addition to their diet. Soy products were mostly disliked, due to their taste. It appears from the findings that greater knowledge on soy health benefits does not guarantee greater acceptance, it does however guarantee higher purchasing behaviour; respondents who believed in health benefits of soy were willing to purchase them more often. A majority (60%), however, disliked the soymilk sample slightly, moderately, very much and extremely; 79% of consumers refused to compromise on taste for health.

Conclusions: Health-orientation does not influence acceptance or liking of a soymilk product when the taste is found unacceptable and therefore is not the driver or motivation for being willing to compromise on taste.

DECLARATION OF ORIGINAL WORK

I hereby declare that work contained in herewith is original and entirely my own work (unless stated otherwise). It has not been previously submitted in support of a degree, qualification or other course.

Signed.....

Date.....

Alena Kusnierikova

TABLE OF CONTENTS

LIST OF TABLES:

LIST OF FIGURES:

CHAPTER 1.

1.2 Introduction

"Let food be thy medicine and medicine be thy food." (Hippocrates, 431 B.C.)

Food serves a much wider role than just satisfying hunger needs and providing a sense of satiety (Saguy and Moskowitz, 1999). Research demonstrates that foods play an important part in disease prevention, or slowing the progress of diseases. According to Tuley (1995), a growing body of scientific evidence supports the argument that certain foods such as health-enhancing foods can improve human health.

Conventionally, food has the primary function of providing individuals with the nutrients they need for their metabolism (nutritional role) and, through its secondary function concerning taste and flavour, that of contributing to individual well-being (sensory or hedonistic role). Over two decades ago, a third, potential role of food has emerged, that of fulfilling a specific "physiological" function to prevent disease at the molecular level. This kind of food is generally referred to as "functional food" if it is taken as part of the usual diet and has beneficial effects that go beyond traditional nutritional effects (Roberfroid, 2002). This tertiary function is said to be independent of the previous two. However, it now appears that the secondary and tertiary functions are linked, if not at odds with each other. (Drewnowski et al., 2000).

The study aims to address consumer acceptance of soya products despite their reported bitter and beany off-flavours and aromas due to phytochemicals present. It also proposes to explore willingness of consumers to accept functional foods that taste worse than substitute conventional foods, as suggested by Urala and Lähteenmäki (2004), and what are the determinants of their willingness to compromise on taste.

1.3 Literature Review

1.3.1 Functional Foods

The relationship between diet and health has focused on relationships between food choice and chronic diseases, including cancer, cardiovascular disease and allergies (Lambert, 2001) and awareness of that relationship "is assumed to be the first step in motivating interest for acquiring knowledge concerning healthy eating choices (Blaylock et al., 1999).

During the past two decades, consumers have switched from an emphasis on satisfying hunger and providing necessary nutrients for humans to a different one. The emphasis now is on the promising use of foods to promote physical and mental well-being and to help prevent and reduce the risk of nutrition-related diseases (Bogue & Sorenson, 2001; Niva, 2007, Nothlings, Murphy, Wilkens, Henderson, & Kolonel, 2007; Takachi et al., 2008).

According to the World Health Organization (WHO) and the Food and Agriculture Organization, several dietary patterns along with lifestyle habits constitute major modifiable risk factors in relation to the development of coronary heart disease (CHD), cancer, type 2 diabetes, obesity, osteoporosis and periodontal disease (WHO, 2003). In this regard, functional foods play an outstanding role and only during the last decade, fundamental studies opened a new field of research dealing with the health promoting features of functional foods (Gobbetti et al., 2010).

The definition of functional foods is an ongoing issue and many variations have been suggested (Arvanitoyannis & Houwelingen-Koukaliaroglou, 2005, Kotilainen et al.

2006). Despite an inconsistence of an internationally accepted definition and no global consensus on its meaning (Health Canada, 2005; American Dietetic Association, 2004; Bech-Larsen & Grunert, 2003; Urala et al., 2003; Coletta, 1999), Pravst (2012) suggests that a consensus on the functional foods concept was reached in the European Union in 1999, when a working definition was established. In the consensus document on "Scientific Concepts of Functional Foods in Europe" of the European Commission Concerted Action on Functional Food Science in Europe (FUFOSE) the following working definition was used:

"A food can be regarded as 'functional' if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease. Functional foods must remain foods and they must demonstrate their effects in amounts that can normally be expected to be consumed in the diet: they are not pills or capsules, but part of a normal food pattern." (Diplock et al., 1999).

It can be argued that functional foods are closely related to, but different from, concepts such as nutraceuticals. Nutraceutical can be defined as "*a product isolated or purified from foods, and generally sold in medicinal forms not usually associated with food and demonstrated to have a physiological benefit or provide protection against chronic disease"* (Health Canada, 1998). A nutraceutical may be a naturally nutrient- rich food such as spirulina, garlic, soy or a specific component of a food like omega-3 oil from salmon (Singh & Sinha, 2012).

As described previously, the concept of functional food has different interpretations in the academic sphere, based on reference to its characteristics, active components or regulatory framework (Hardy 2000; Kwak and Jukes 2001).

The concept of nutraceuticals is also polysemic; however, from the standpoint of the consumer, nutraceutical is functional food that helps to prevent a disease or collaborate in its treatment and is recognized for these effects (Pochettino et al., 2012). In this context, it is noteworthy that what for a consumer is a functional food, for another one can act as a nutraceutical (Kalra, 2003) and that recognition (which guides the action of the consumption) is a consideration of the perspective of the subjects investigated (Pochettino et al. 2012).

Following these definitions, functional food could be considered nutraceuticals – as long as they can be derived from natural sources (Stein & Rodríguez-Cerezo, 2008).
As defined later, this research focuses on soya as a functional food. Even though the term nutraceuticals can cover functional food and arguably soya can be viewed in both terms, due to the current legislative discrepancies of the health claim on soya (explained later) in the UK, in this report use of the term "nutraceuticals" will be avoided.

Functional foods differ from conventional foods in several ways. Firstly, conventional 'healthy' foods are typically presented as types of foods contributing to a healthy diet, e.g. low-fat products, high-fibre products, or vegetables, without emphasizing the role of any single product. In functional foods, particular components are directly connected with well-defined physiological effects and the health benefit is linked to a single product (Urala and Lähteenmäki, 2003). Usually scientifically proved substantiation about the health effect is required when manufacturers develop specific, functional

products (Urala and Lähteenmäki, 2004). The increasing demand on such foods can be explained by the increasing cost of healthcare, the steady increase in life expectancy and the desire of older people for improved quality of their later years (Siro, 2008; Roberfroid, 2007).

The first functional food products were launched in Japan where a food category called FOSHU (Foods for Specific Health Use) was established in 1991 to reduce the increasing health-care costs sparked by government policies to improve health (Shimizu, 2003; Devcich et al., 2006), where the term 'functional food' itself was used for food products fortified with special constituents that possess advantageous physiological effects (Hardy, 2000; Kwak & Jukes, 2001). To receive FOSHU status, the evidence of the health or physiological effect in the final product has to be scientifically proven and the product has to be in the form of an ordinary food and not supplements. So far, Japan is the only nation that has specific legislation covering functional foods.

To promote the use of any particular functional food its beneficial effects must be communicated to consumer. This is usually done through the use of nutrition and health claims in the labelling and advertising of foods. Pravst (2012) suggests that in this context, functional foods in Europe are probably most critically affected by the *Regulation (EC) No 1924/2006 on nutrition and health claims made on foods* (EC, 2006; European Food Safety Authority [EFSA]c, 2012).

European legislation however, does not consider functional foods as specific food categories, but rather a concept (Coppens, Da Silva, & Pettman, 2006; Stanton et al., 2005). Therefore, the rules to be applied are numerous and depend on the

nature of the foodstuff. In the EU, instead of regulating the product group per se, legislative efforts are directed towards restricting the use of health claims on packages and in marketing (EC,2006; Niva, 2007).

According to the EU regulation on nutrition and health claims made on foods (EC No. 1924/2006), a list of authorised claims has to be published for all member states, and nutrient profiles also has to be established for foods containing health claims. Health claims can be ‘‘function claims’’ and ‘‘reduction of disease risk claims’’.

According the latest report called Functional Foods Market Assessment 2010, doubts have been expressed about some of the health claims made by manufacturers, and the EFSA is in the process of evaluating all such claims. Those that are not approved by the EFSA will not be allowed to be used in promotions within the EU until they are modified or better scientific evidence is provided (Functional Foods Market Assessment, 2010).

Despite that, the total UK market for functional foods grew by an estimated 9.6% in the year ending October 2009, to a value of £1.46bn. Over the next 5 years, sales of functional foods are forecast to increase at closer rates to their traditional counterparts, with overall market growth estimated at 4.5% to 6.5% per year (Functional Foods Market Assessment, 2010). However, the development of new functional food products turns out to be increasingly challenging, as it has to fulfil the consumer’s expectancy for products that are simultaneously relish and healthy (Shah, 2007).

1.3.2 Acceptability of Functional Foods:

Consumer acceptance of the concept of functional foods, and a better understanding of its determinants, are widely recognized as key success factors for market orientation, consumer-led product development, and successfully negotiating market opportunities (Ares & Gambaro, 2007; Gilbert, 2000; Grunert, Bech-Larsen, & Bredahl, 2000; Verbeke, 2005). Functional foods must compete with conventional food products that are available in the marketplaces (Frewer et al., 2003; Mark-Herbert, 2003). If consumers do not have strong incentives to switch to functional foods they are likely to continue consuming non-functional alternatives. Key factors here are the taste and other organoleptic properties and convenience of functional foods as perceived by the consumer (Blandon, Cranfield & Henson, 2007). However, acceptance failure rates from food cases such as GM foods or foods using techniques like rBST in milk production, beef growth hormones, or food irradiation have shown that consumer acceptance is often neglected or at least far from being understood (Verbeke, 2005).

Many factors affect consumers' acceptability of foods. Cognitive, motivational and attitudinal determinants of consumer acceptance of functional foods have been addressed in different countries (Bech-Larsen & Grunert, 2003; Cox, Koster, & Russell, 2004; Urala & Lähteenmäki, 2004; Verbeke, 2005), providing insight in the profile of functional food consumers (Saher et al., 2004). Consumer acceptance of functional foods is far from being unconditional, with one of the main conditions for acceptance pertaining sensory characteristics, besides trustworthiness of health claims (Urala & Lähteenmäki, 2003; Verbeke, 2006). Taste is consistently rated as the most important factor that drives consumption and repeat purchase (Cardello et al., 2007) and an extremely important factor especially when choosing functional foods (Childs, 1997;

Gilbert, 2000; Lyly at al., 2007; Nielsen, Bech-Larsen, & Grunert, 1998; Poulsen, 1999; Tuorila & Cardello, 2002; Urala & Lähteenmäki, 2003). Despite people citing nutrition and health as important in product selection (American Dietetic Association 2004), good taste is a more dominant market force.

Earlier studies show that taste of functional foods was more important in Denmark and England than the products' health benefits. (Jonas & Beckmann, 1998) Taste was also found to be the most important determinant for use of a nutraceutical product (Cardello & Schutz, 2003). Munene (2006) reported that 45 percent of US consumers consider taste/flavour as the most important factor in making a food purchase decision.

Since taste occupies a key position, it has to be faultless as it strongly influences food choices (Arvola, Lähteenmäki, & Tuorila,1999), in many cases surpassing health issues (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Tepper & Trail, 1998). Although increasing the functionality of the food should not necessarily change its sensory quality (Urala & Lähteenmäki, 2004), bitter, acrid, astringent or salty off-flavours often inherently result from enhancing food functionality with bioactive compounds or plant-based phytonutrients (Siro et al, 2008). For instance, Tuorila and Cardello (2002) found that the occurrence of off-flavours in juice decreased its acceptance and consumption despite the presence of convincing health claims. Camire (2000) also reported on the addition of three different types of extract of ginseng to orange juice, where the orange juice took on a brown colour and medicinal taste. Along with botanical or herbal incorporation, increased protein levels, and vitamin and mineral fortification can lead to unacceptable flavours in functional foods (LeClair, 2000) and marked alteration in the product's colour (Camire, 2000).

Furthermore, β-glucan was found to influence the sensory thickness of orange juice (Lyly et al., 2004) and soup (Lyly et al., 2005), a juice drink containing a probiotic culture has been reported to have off-flavours (Luckow & Delahunty, 2004) and functional orange juice has been described as having artificial and medicinal flavours (Luckow & Delahunty, 2004).

The importance of good flavour has increased in recent years with more people indicating they rarely or never gave up good taste for health in 2004 compared to 1994 (Information Resources Inc, 2005). Nutritious products that do not deliver satisfactory flavour do not remain in the market, as illustrated by the rise and fall in demand for low carbohydrate foods perceived as helpful in weight management (Information Resources Inc, 2004).

Bolles (1991) also argues that hedonic properties of food are certainly the main drivers behind human food choices. 'Taste' is consistently reported as a major influence on food behaviour. In reality 'taste' is the sum of all sensory stimulation that is produced by the ingestion of a food. This includes not only taste per se but also smell, appearance and texture of food. These sensory aspects are thought to influence, in particular, spontaneous food choice (EUFIC, 2005).

From an early age, taste and familiarity influence behaviour towards food. A liking for sweetness and a dislike for bitterness are considered innate human traits, present from birth (Steiner, 1977). Taste preferences and food aversions develop through experiences and are influenced by our attitudes, beliefs and expectations (Clarke, 1998).

There is a real risk that applying new technologies and compounds to foods negatively affects the taste and other sensory characteristics (Tuorila & Cardello, 2002; Lyly et al., 2003; Lyly et al., 2004; Luckow & Delahunty, 2004; Luckow & Delahunty, 2004) and

consumers tend to have real doubts concerning the impaired taste of these foods (Jonas & Beckmann, 1998; Bäckström et al., 2003; Verbeke, 2005). Functional ingredients that weaken the sensory quality of functional foods reduce the acceptance of such foods (Luckow & Delahunty, 2004). Due to bitter, acrid or astringent off-tastes often deriving from functional ingredients (Drewnowski & Gomez-Carneros, 2000), the explosion of functional foods underscores the dilemma of trading off taste for health benefits as well as posing a dilemma for functional food designers because of potential aversive consumer reactions to the resulting taste.

The health related information may influence the acceptance of the functional food, but not the hedonic evaluations (Stein et al., 2003) and medicine-like flavour does not support the perception of health benefit (Tuorila & Cardello, 2002). The taste of products in a study by Lyly et al. (2007) had a strong influence on the willingness of a consumer to use them. Health claims provided additional value to beverages and soups, although the sensory quality of the products was more important. Furthermore, participants in a study by Stein et al. (2003) who were given information about the health effects of an unfamiliar beverage chose more bottles as a reward after the experiment compared to the group who did not receive the information. However, the information did not affect the hedonic ratings.

Tuorila and Cardello (2002) also reported that a slightly bitter off-flavour from added potassium chloride did not support the perceived health benefit of US participants (Tuorila & Cardello, 2002).

Similarly, that over half of the participants in Verbeke (2005) study stated that they would not readily compromise the taste of a food even if the food was functional.

The health benefits clearly increase the acceptance of functional foods maybe by increasing the perceived healthiness (Bech-Larsen & Grunert, 2003), but, in the end, the hedonic characteristics are certainly one of the main drivers affecting functional food acceptance (Tuorila & Cardello, 2002; Bower et al., 2003; Moskowitz et al., 2004; Huotilainen et al., 2005) that cannot be overlooked.

Huotilainen et al. (2005) showed that the liking ratings of new functional drinks were the strongest predictors of the preferred use frequencies. Bower et al. (2003) reported that Scottish people's purchase intent of spreads labelled with a proven health effect was strongly related to the degree of liking, in addition to the health label.

These findings clearly indicate that functional food products are expected to have excellent hedonic properties providing taste-driven hedonic pleasure (Bolles, 1991). Both the degree of hedonic liking and the health effect seem to have a positive influence on functional food acceptance, though the liking and perceived healthiness have previously represented contrary dimensions in food choice (Tepper & Trail, 1998).

1.3.3 Soya Products in the Functional Food Market

Soybean is called "meat of the field" from ancient time (Jooyandeh, 2011). The use of soy ingredients in foods is currently receiving significant attention from the food industry and consumers, because of its role as a functional food (Wu et al, 2005).

The demand for alternatives to dairy products is growing due to problems with intolerance and allergy, desire for vegetarian alternatives and so on and hence the interest in soy-based foods has developed (Granato et al., 2010).

Soya is now a mainstream food firmly established on the Eatwell Plate and recognised for its nutrition qualities and health benefits (Department of Health, 2012). The British Heart Foundation (BHF) and British Dietetic Association (BDA) also recommend soya in their food facts leaflets, for example on food facts on soya (BDA, 2007), vegetarian diets (BDA, 2011) and cholesterol (BDA, 2010). BHF booklet on reducing cholesterol states that "soya products are naturally low in saturated fat and a good source of soluble fibre, antioxidants and protein, which may help to lower your cholesterol. Choosing soya, particularly as a replacement for meats or other foods that are high in saturated fat, is likely to be good for your heart"(BHF, 2011).

An integral part of the Asian diet for over 5000 years (Food Standards Agency [FSA], 2002), the UK consumer has only appreciated soya foods for the past 100 years. The intake of soya protein is relatively modest in the UK. Information on its consumption is not collected specifically within the National Food Survey or National Diet and Nutrition Surveys. Although claims in the press suggest we are consuming huge amounts of soya, estimates of soya protein intake, derived from the isoflavone content of the diet indicate that current soya protein consumption in the general population is typically between less than 1g-3.5g per day (BDA, 2007). New soya food products are entering the market all the time and include milks, yoghurts, frozen soya beans (edamame), cream, bread, desserts and meat alternatives such as TVP and tofu (Jones et al., 1998; Boyan et al., 2001). As a more efficiently produced source of protein than animal protein, soya is set to be a key player in sustainable diets for the future (Carlsson-Kanyama, 2009).

The soya bean is one of the few plant foods to contain all essential amino acids with a digestibility score similar to meat and dairy products (Rand, 2003). In the UK, one

portion of soya beans can count towards the recommended five portions of fruits and vegetables a day (BDA, 2007).

Past several years of clinical and scientific evidences have revealed the medicinal benefits of the soy components against metabolic disorders (cardio-vascular diseases (CVD), diabetes and obesity) as well as other chronic diseases (breast and prostate cancers, osteoporosis, menopausal syndrome and anaemia). Many of the health benefits of soy are derived from its secondary metabolites, such as, isoflavones, phyto-sterols, lecithins and saponins (Dixit et al., 2011, Devi et al., 2009).

Soya is naturally low in saturated fat and is the main dietary source of bio-active substances isoflavones (Wu, 2004; Franke, 1998), specifically isoflavones in their glucoside (genistin, daidzin and glycitin) or aglycone (genistein,daidzein, and glycitein) forms (Sanz & Luyten, 2006), while their principal phenolic acids are syringic, chlorogenic, gallic, vanillic and ferulic (Tyug, Prasad, & Ismail, 2010).

Isoflavones are a type of phytoestrogens similar in structure to human oestrogen (17b-oestrodial) but with its potency in humans being 100's of 1000's times weaker (BNF, 2002; Morton, 2001; Messina, 2001). Often classified as selective oestrogen receptor modulators (SERMs) isoflavones have an affinity for beta oestrogen receptors found in many tissues including breast, prostate and heart (Cassidy, 1994; Sir, 2001). In humans, isoflavones have the potential to benefit health through their unique capacity to act as either weak oestrogen agonists or antagonists (Cassidy, 1994; BDA, 2002). Furthermore, phytoestrogens have been shown to exhibit potent antioxidant activities and they may have other potential benefits such as effects on cell health (BDA, 2007).

Soya is the only plant food considered to be a complete protein (containing all essential amino acids to meet the human body's requirement in sufficient quantity to support

normal growth and development after correcting for protein digestibility) and it also contains fibre, mainly of the soluble type and a number of vitamins and minerals (BDA, 2007). Soybean is considered high biological value protein, where its protein isolate has a biological value of 74 (FAO, 1991; Hoffman and Falvo, 2004). Whole soybean has a biological value of 96, and soy milk 91 (Smith and Circle, 1972). Research has indicated a strong link between serum cholesterol levels and the prevalence of Coronary Heart Disease (CHD) (Law et al, 1994). CVD remains the number one killer in the UK, responsible for around one third of all deaths in 2009, and CHD accounting for over 82,000 deaths in 2009 (BHF, 2012). An elevated serum level of low-density lipoprotein cholesterol (LDL-C) is a main contributor to CHD. A 1% drop in LDL-C is associated with a 2-3% reduced CHD risk (Law, 1994). Two thirds of the UK population have elevated serum cholesterol levels (>5.0mmol/l) putting them at high risk of CHD (Jessani et al., 2006).

Two separate effects underpin the cholesterol-lowering effect of soya-based foods. Firstly, soya protein specifically interferes with the body's LDL-C receptors, reducing LDL-C production by 3-5% (Harland & Haffner, 2008; Jenkins, Mirrahimi, Srichaikul et al, 2010; Sacks, 2006; Balk et al., 2005; Weggemans, 2003). Secondly, the inclusion of soya foods in the diet, result in a stepped reduction in saturated fat through the displacement of higher SFA containing animal proteins (Jenkins et al., 2010).

Studies have demonstrated that consuming 25g of soya protein a day leads to a 0.23mmol/l reduction in total cholesterol, which could equate to a 10% reduction in CHD risk if your initial cholesterol level was 4.6mmol/l. Soya has a greater cholesterol lowering effect when the initial cholesterol levels are higher (Anderson et al., 1995). Amore recent meta-analysis of 39 studies demonstrated that LDL-C reductions of 6%

can be achieved from as little as 15g soya protein per day – 2 x 250ml glasses of soya milk alternative or a handful of soya nuts (Harland, 2008).

In the UK, the claim is intended that information about soya protein content per serving is carried on the label of foods, making it easy for consumers to tot up their total soya protein intake should they wish to do so (Joint Health Claims Initiative [JHCI], 2002).

In 2002 the UK JHCI approved use of food health claims that '*the inclusion of at least 25g of soya protein a day as part of a diet low in saturated fat can help to reduce cholesterol in the blood'*. However, this was rejected by EFSA who have superseded the JHCI as UK joined broader EU initiatives. In December 2006, the European Commission passed a new EU regulation (1924/2006) on Nutrition and Health Claims. The regulation was implemented in the UK six months later. Although the discussion is still ongoing, and many associations have filed their protest to the EU commission after the latest EU soy-cholesterol health claims appeal failed, it now appears that the EFSA have shut the door for the claim in the European Union, after dismissing a series of formal objections to its third rejection of soy cholesterol-lowering capacity in June 2012. In its latest appeal, the soy industry submitted a meta-analysis of 23 clinical studies by Harland (2010), most of which were randomized controlled trials, in hope that EFSA would accept the general conclusions. EFSA, however, concluded that four of the randomized clinical trials "did not allow conclusions to be drawn on the effects of isolated soy protein on blood cholesterol concentrations owing to inadequate methodology or insufficient reporting." The remaining randomized clinical trials were "at high risk of bias, owing to methodological limitations in the analysis and/or had poor reporting of the data." Furthermore, the differences in the results obtained

between trials appeared to be unrelated to the doses of soy protein isolate used, the sample size or the study duration (EFSA, 2012a).

In its further correspondence with EFSA, the scientific committee (*The Scientific Advisory Committee (SAC) of the European Natural Soyfoods Manufacturers Association (ENSA))* emphasized that the totality of the data clearly supports the contention that soy protein lowers cholesterol and that a health claim for soy protein was approved in the UK by the JHCI in 2002 based on the same criteria used in the current Article 14 application. Therefore, despite some of the clinical research having methodological limitations, the ENSA SAC requested that EFSA take the results of the meta-analysis submitted as part of the Article 14 application into consideration (EFSA, 2012a). They also asked the European Commission not to make a decision regarding the adoption or rejection of this claim before EFSA reconsiders its opinion on the scientific evidence submitted in support of this health claim, including the results of the submitted meta-analyses. According to the EU rules, all health claims are forbidden if not explicitly allowed by a positive opinion of the EFSA (The Isoflavone Research Initiative, 2010). However, even when claims are rejected, it may be some time before companies actually drop them from their packaging. EFSA's opinions must first be adopted by the European Commission and companies will then have six months to comply. In the UK, the law states that any health claim on food labels must be true and not misleading. Food producers may optionally use the (Discontinued in 2010) JHCI to determine whether their claims are likely to be legally sustainable (Bowdle, 2010). Currently, some soy products still carry the cholesterol claim on the packaging, including Alpro soya milk used in this study.

There is further interest in what's known as the Portfolio effect. Recent evidence (Jenkins et al., 2006) indicates that the combined use of soya protein, soluble fibre, almonds and plant sterols have the potential to decrease LDL cholesterol by 20% equivalent to a first line statin drug. This approach cannot replace statins but can provide a useful adjunct to statin therapy in motivated patients, as well as an approach for those who cannot or do not wish to take statins (BDA, 2007).

Soy's bone-sparing effect is fairly well documented in in vitro and in vivo studies but is less supported by human clinical trials.' Populations consuming large amounts of soya appear to have higher bone densities than those with a lower intake of soya (Greendale et al., 2002). Asian soya consumers consistently show better bone density and lower incidence of fractures (Zhang, 2005; Koh, 2009; Marini, 2008; Alekel, 2009). Research is currently focusing on isoflavones' weak oestrodial effect on bone tissue and the impact of soya protein on the body's acid-base balance. (Donkor, Henriksson, Vasiljevic, & Shah, 2007; Tang & Mab, 2009).

Certain Asian countries tend to have a lower prevalence of cancers of the breast, prostate, uterus, and colon (Potter et al., 1996). According to World Cancer Research Fund (2012), breast cancer is the most common form of cancer for UK women with dietary and lifestyle factors playing an important role. Epidemiological studies in Asian populations have consistently demonstrated early soya consumption to protect against breast cancer in later life (Lamar, 2000; Shu, 2001; Wu, 2009; Lee, 2009; Messina, 2009). As little as one glass of soya milk a day in childhood and adolescence has been associated with a 25-50% reduced risk of developing breast cancer later in life (Lamar, 2000; Shu, 2001; Wu, 2009). The soya isoflavone genistein is proposed to stimulate breast cell differentiation during developmental years and by doing so reduces the cell's

likelihood of turning cancerous in later life (Messina, 2009). Recent research also suggests that soya consumption may be beneficial for women diagnosed with breast cancer (Shu, 2009). However, some concerns have been raised over a possible detrimental effect of soya in breast cancer patients (Hsieh et al., 1998; Allred et al., 2001), questioning whether soya increases breast cancer risk and whether breast cancer patients with estrogen receptor-positive (ER+) breast tumors (taking and not taking tamoxifen) should avoid soya. (Duffy et al., 2003). Overall, there is no clear indication that consumption of soya food is not acceptable in those at risk of breast cancer or with breast cancer (Messina, 2001).

Research also indicates that approximately 50mg isoflavones (2 servings) a day has the potential to reduce hot flush frequency during the menopause by 25% as a result of isoflavones' weak oestrogenic effect (Kurzer, 2009; Ferrari, 2009; Howes, 2006; Crisafulli, 2004; Khaodhiar, Nahas, 2007; William-Hughes, 2006;13). The effectiveness of isoflavone treatment depends on both severity and frequency of hot flushes – with most benefit seen in those experiencing more than 4-6 daily episodes. Based on the current evidence, the American Menopause Society's position paper suggests that a regular and modest intake of whole foods containing isoflavones has the potential to relieve menopausal symptoms (The North American Menopause Society, 2000). More importantly, soya consumption should be actively encouraged in this group for its cholesterol lowering and cardioprotective effect.

Though further research is needed, Dixit et al. (2011) suggested that diabetic patients with soybean diets show several potential advantages, such as, reduced insulin resistance, renal damage, and fatty liver, thereby improving their quality of life. Furthermore, Canabady-Rochelle and Mellema (2010) had concluded by a thermodynamic study that soy protein could be a possible protein vector for further Ca

supplementation, since the nature of Ca-protein interaction is similar in cow's milk. Therefore, foods derived from soy, such as soy milk, become an alternative since they are lactose free (Mattos et al., 2009).

1.3.4 Implications for Consumers and Expected Impact on Overall Diet.

Soya fits in well with current dietary guidelines. The UK reference nutrient intakes (RNI) for protein in 19-50 year old men is 55.5/day and in women 45.0g/day (Department of Health, 1991). However, DRVs are currently under the interest of the EFSA, which intend to extend them at the EU level. In February 2012, EFSA published Population Reference Intakes (PRIs) for protein. A PRI indicates the amount of an individual nutrient that the majority of people in a population need for good health depending on their age and sex. PRI for adults of all ages (18-59) was estimated to be 0.83 g protein/kg body weight per day. Based on the average weight of 74.6 for males and 62.1 for females, they estimated that the PRI should be 62g/d for males and 52g/d for females (EFSA, 2012b).

In Codex Alimentarius the RNI for protein related to claims is 50g/day. The replacement of up to half the protein intake with 25g soya protein can not only have a potential beneficial effect on cholesterol, but also substitution of animal protein with soya protein will tend to reduce the saturated fat content of the diet and may also help to maintain bone health in the elderly (Messina, Gugger & Alekel, 2001).

When soy entered the Western mainstream consciousness in the 1960s, its time in the limelight was brief. The taste didn't meet consumers' expectations, so soy reverted to its former status as a niche food for core health food consumers (Starling, 2005). However,

research has grown in recent years focusing on consumers' behaviour toward soy foods. It is documented that consumers are increasingly aware of the healthfulness of soya based foods they consume and take such a health attribute into consideration when making soya food purchasing decisions (United Soybean Board, 2007). Moon et al. (2005) showed that consumers' perceived health benefits of soy foods significantly increase the likelihood as well as the frequency of consuming soy foods. Wansink and Chan (2001) concluded that nutritional knowledge of functional foods was associated with soy consumption, while Wansink et al. (2005) highlighted the role of consequence related attributes in consumers' soy food consumption decision (i.e., how a given soy food attribute will benefit them).

1.3.5 Acceptance of Soya Products.

The three most consumed soy foods of the EU market are soymilk, soy desserts and soy steaks (Tu et al., 2012). The soy product chosen for this research is soymilk as it is the most popular soy food in the West and has seen the greatest growth over the years (Prepared Foods, 2009). Consumers in western countries consume soymilk mainly as an important replacer of cow milk due to lactose intolerance or allergy and as a low cost source of good quality protein and energy (Jooyandeh, 2011).

In the UK, soya milk has grown both volume and value sales since September 2011 and September 2012, bucking the total market trends. However, it still remains a small section of the liquid milk market, with a 1.6% volume share of the total milk market (Agriculture and Horticulture Development Board, 2012).

The incorporation of soymilk in human diets is arousing an increasing interest due to its important nutritional properties such as calcium, high quality proteins, polyunsaturated

fatty acids; and an accurate content of isoflavones (Rinaldoni et al., 2012) and is a rich source of available bioactive compounds (Rodríguez-Roque et al., 2012). Soymilk is an aqueous extract of whole soybeans, containing high amounts of protein, iron and niacin, but low concentration of fat, carbohydrates and calcium compared to cow and human milks (Jinapong, Suphantharika, & Jamnong, 2008). Additionally, soymilk is cholesterol and lactose free. For these reasons, soymilk is considered an excellent alternative to cows' milk for people with milk protein allergy, lactose intolerance or galactosemia (Xu & Chang, 2009).

Many soymilks are fortified with calcium, vitamins A and D, riboflavin, zinc and vitamin B12 (Jooyandeh, 2011).

Although soymilk, tofu, yuba, and the fermented products natto, miso, tempeh and soy sauce continue to be important foods in Asian countries today, acceptance of the traditional Asian style soy foods has been slow in western countries because of one common complaint related to soymilk and soy-based foods: their poor sensory characteristics (Mital et al., 1974; Lee et al., 1990).

The main objections to soybean products by consumers are the associated intrinsic flavour described as beany/grassy (and other off-flavours and aromas) or astringent and the phenomenon of flatulence (Jooyandeh, 2011). Genistin, a bitter and astringent isoflavone glucoside (Chang, Huan, Ho, 1990), is thought to be responsible for the objectionable taste of soy protein (Carrão-Panizzi, Kitamura, 1995). Isoflavones are associated with the protein fraction in soybeans, soy isolates, and texturized soy protein (Song, Barua, Buseman, Murphy, 1998). Hexane-defatted soy flours, soy concentrates, and isolates all have an undesirable bitter taste and an undesirable flavor -"beaniness" (Okubo et al., 1992). L-Phenylalanine and phenolic acids (syringic) in soy products

have also been described as phenol-like, bitter, astringent, or sour. Enzyme or acid-based hydrolysis of soy proteins produces additional bitter soy peptides and bitter hydroxy fatty acids. Soy flours are reported to have an astringent aftertaste and a chalky mouth feel (Klein, Perry, Adair, 1995). Bitter isoflavone glucosides, genistin and daidzin, are hydrolyzed during fermentation to bitter isoflavone aglycones, genistein and daidzein. Genistein and daidzein are said to be responsible for the objectionable taste of soy milk. Their concentrations increase during soaking of soybeans, the first step of soy milk manufacturing. They also impart the characteristic taste to the secondary products miso, soybean paste, and soy sauce (Okubo et al., 1992). As shown in Figure 1, the objectionable aftertaste of soy milk was linked to its genistein and dadzein contents.

Figure 1. Relation between the objectionable aftertaste (on a scale of 0–4) and the amount of dadzein (•) and genistein (▲) present in soy milk. Data from Matsuura, Obata, Fukushima,1989.

Nearly three quarters of Americans still do not use soy products, though not for a lack of awareness. According to a 2008 consumer survey sponsored by the United Soy Board, 85% of consumers are aware of soy's health benefits, however, negative taste perceptions are a key reason why they have not embraced soy foods (Heyl-Rushmer, 2009). In fact, a Mintel survey finds nearly half (45%) consumers say they do not like the way soy foods taste (Mintel, 2008). Wu et al. (2005) also found that yogurts without soy protein had higher consumer acceptance scores than yogurts containing soy protein.

This poses a dilemma for the designers of functional foods because increasing the content of bitter phytonutrients for health may be wholly incompatible with consumer acceptance. (Drewnowski et al., 2000). This taste-health discrepancy becomes even more vivid when analyzing how many healthy foods have good trial rates but poor repeat sales (Wansink et al, 2000). The soy food and beverages market declined 14% during 2008-10 in FDMx and natural supermarkets combined, reaching an estimated $2.6 billion in 2010. While some of this is due to the recession and consumers cutting back on somewhat premium-priced soy-based items, competition from other healthy foods is also challenging the industry. Additionally, good tasting grain-based milk alternatives are luring consumers away from soy, thus hampering sales (Mintel, 2011).

According to Fewer et al (2003) “Even a functional food with desirable and proven health benefits may not be attractive to consumers, if its sensory properties do not meet consumer expectations, or if it is simply too expensive to warrant purchase.” Augustin (2001) also confirms that “consumers want foods that are associated with maintenance of well being or the prevention of a disease, but are not willing to compromise on taste, convenience or value.”

All that evidence indicates that consumers are not prepared to compromise intrinsic product attributes such as appearance, aroma, flavour and texture for a perceived benefit in terms of health (Augustin, 2001; Goldberg, 1994; McIlveen and Armstrong, 1995; Conforti et al, 1996; Sloan, 2000; Cox et al., 2004)) and that taste, as opposed to perceived nutrition or health value, is the key influence on food selection. (Glanz, 1998, cited in Drewnowski & Gomez-Carneros, 2000). Furthermore, Hosken in his article states, that after expert sensory panel analysis of 7 brands of soymilk at the research agency of Arthur D. Little, the panel concluded that "Soy foods today simply do not

meet consumer flavour expectations. The average consumer is not willing to trade taste for health benefits, no matter how great "(Hosken, 2007).

1.3.6 Nutritional Information and Consumer's Knowledge.

In many cases, however, product information has influenced the perceived benefit and thereby the willingness to use a product. The name of the product, its price and its nutritional benefit information had a significant effect on the intention to buy a fat spread (Bower, Saadat, & Whitten, 2003). Kahkonen, Tuorila, and Rita (1996) found that a low-fat spread was better accepted if consumers received nutrition information before using it. Product information as such may not in all cases be effective in influencing the acceptability of foods. Attitudes and personal motivation define the relevance of the product information to consumers and determine its efficacy.

Attitudes may determine the effect of product information on liking and the likelihood of buying a product (Shepherd, Sparks, Bellier, & Raats, 1991). The sensory ratings of a spread labelled as being reduced-fat were more positive if the respondents' attitudes towards a reduced-fat spread were positive (Aaron, Mela, & Evans, 1994). In a study by McFarlane and Pliner (1997) on novel foods, general nutrition information increased the willingness to taste novel foods if nutrition was important to the participants. This could also be true with health-related motivational factors: a personal need to prevent illness or to pay attention to one's own health may affect the willingness to use a product with a suitable health claim.

In accordance with a research carried out by the United Soy Board (2009), approximately 33% of U.S. consumers seek out products containing soy and approximately 31% of consumers are aware of specific health benefits of soy in their diet; on an aided basis, consumers are most aware of the health benefits of soy in relation to weight management (31%), reduced risk of heart disease (27%) and some cancers (20%); over 34% of consumers said they are aware of the FDA claim that consuming 25 g of soy protein per day reduces the risk of coronary heart disease; and 84% of consumers perceive soy products as healthy.

Those facts make us ask the following questions, which forms the aim of this research: Are western consumers willing to accept soy products despite not having great sensory properties? Can that sensory factor be outweighed by the perceived health benefits?

1.3.7 Consumer Acceptance of Soy Products and Willingness to Compromise on Taste for Health Benefits.

According to Jaeger (2006) today's world makes the consumer to trade several factors against each other in order to select which food they buy or eat. Therefore, consumers might have to trade health, sensory and other non-sensory factors, such as brand and price, when deciding to buy a certain functional food (Ares et al., 2010).

The evidence on the degree to which consumers are willing to compromise taste in order to derive the potential health benefits of functional foods is mixed. Urala and Lähteenmäki (2004) provide suggestive evidence, however, that Finnish consumers are willing to compromise the taste of food to obtain health-enhancing benefits, specifically

in the case of juice enriched with probiotics, cholesterol-lowering spread, blood pressure-lowering milk and meat products with more fibre.

Conversely, Verbeke (2006) finds that Belgian consumers are not willing to compromise taste for the health benefits of functional foods, where less than 10 % of respondents are willing to accept functional foods if they taste worse than conventional foods. At the same time, around 40 % of consumers are willing to accept functional foods if they taste good. Accordingly, only 27% of respondents in 2006 reported that they are willing to compromise taste for health benefits (Decima Research, 2006). This is further corroborated by National Institute of Nutrition (2004) that reports that taste is a very important factor in choosing food among 72% of Canadians. McIsaac et al. (1993) reported that flavour (89%) was the most important factor in the decision to buy soy-containing products, followed by perceived health benefits of a product (64%). Similarly, in a study of Tepper and Trail (1998) (cited in Urala, 2003), consumers preferred taste and sensory quality to the healthiness of corn chips.

The research reported above provide a rather mixed picture on the willingness of consumers to trade-off taste and other sources of pleasure from food and potential health benefits. Clearly, if functional foods have the same organoleptic properties as their non-functional counterparts, this is not an issue. However, where taste, texture and aroma, for example, differ this may be the cause of novel functional foods to be rejected among consumers.

As previously discussed, taste continues to be the primary obstacle to soy food acceptance and mainstream consumers are reluctant to compromise taste of functional foods for eventual health benefits, (Ares, Giménez, & Gámbaro, 2008; Poulsen, 1999;

Tuorila & Cardello, 2002; Verbeke, 2006). The fact that the faulty taste of the product cannot be compensated with health effects has also been established by Lyly et al. (2007), where health claims had a significant but small positive effect on expected liking in beverages, although once they had been tasted, the liking for beverages with b-glucan decreased and the beverage containing no b-glucan was the best liked.

However, an opposing position on this is that the individual who consumes functional foods is committed to its benefits and may be willing to suffer some unpleasant taste in order to achieve the desired health benefit. (Tuorila & Cardello, 2002). "Motivated consumers can translate an assumed health benefit into better liking for a new product" (Kahkonen et al.,1996; cited in Tuorila & Cardello, 2002). A recent study by Chang et al. (2012) concluded that while taste is the dominating attribute that drives consumers' willingness to pay for soy food products, consumers do respond to the information provided in the health claim. Communication can have a great impact on changing consumers' knowledge and attitudes and reshaping their decision-making processes (Verbeke, 2008).

"Even if liking remains unaltered, the purchase interest may increase if a health benefit is expected" (Tuorila et al, 1998, cited in Tuorila & Cardello, 2002). Therefore there is an assumption that people will be more accepting of functional foods if there is a concrete and tangible consumer benefit (Fewer et al., 2003). The empirical findings from Verbeke (2005) study also supported the same theory, stating "that health benefit belief consistently emerges as a strong positive determinant of functional food acceptance in general, and willingness to compromise on taste" (Verbeke, 2005). Furthermore, Wu et al. (2005) study showed that the overall acceptance of soymilk yogurt was higher when consumers believed that soy foods are beneficial to their health.

Similarly, in a study by Gobert and Duncan (2009), significantly more soy consumers with type 2 diabetes (consuming soy as their diabetes management plan) reported liking the taste of soy compared to soy non-consumers, and taste and texture were identified as barriers to soy consumption significantly more often by soy non-consumers than soy consumers with type 2 diabetes.

All that research suggests that the consumer's view of the importance of the health benefit may lead to the acceptance of an inferior taste in order to achieve health benefits. In view of the possible trade-offs between taste and health, this present study was designed to answer the following research objectives:

1.4 Research Aim and Objectives:

Aim: The study aims to investigate whether health-orientation, is the driver or motivation behind willingness to compromise on taste in favour of the health benefits of soy products despite their reported poor sensory characteristics.

Objectives:

-to investigate if consumers are willing to accept soy products despite problems with taste perception due to their reported bitter and beany off-flavours and aromas

-to determine/explore whether consumer understanding of the diet-health relationship would be an important factor influencing their choice of purchasing and preference for soy products.

-to investigate the relationship between consumers' acceptance and consumers' perception of health benefits from consuming soy products.

Project hypothesis:

Primary hypothesis:

“Consumers are willing to accept soy products, despite their potential taste perception problems and health-orientation is the driver or motivation behind that willingness.”

Secondary hypothesis:

“Health benefit belief is a positive determinant of soy acceptance in general.”

“Understanding of the diet-health relationship influences consumers' choice of purchasing and preference for soy products.”

CHAPTER 2: Methods

2.1 Study Design.

The methodology chosen for this research was that of a mixed methodology whereby a qualitative approach was used to enhanced the interpretation of a quantitative data. Since this project has a multiple objectives, a sequence of difference methods was required (Lawless, 1998). To understand sensory properties that drive consumer soymilk choices, sensory method linked with consumer research was used in sequential manner to guide our efforts. The following sequence of methods was used:

Quantitative method 1: Consumer survey of attitudes toward and knowledge of the benefits of soy including sensory acceptability tests of soymilk.
Qualitative method 2: Focus group discussions including sensory acceptability tests of soymilk.

This research can be classified as a descriptive research. It is an approach that involves either identifying the characteristics of an observed, pre-existing phenomena or exploring possible correlation among two or more phenomena" (Leedy & Ormrod, 2001). The correlation among organoleptic properties and consumers perception of health benefits of soy milk products, as well as willingness to compromise on taste was being explored in this study.

The dependent variable was willingness to compromise on taste in favour of the health benefits of soy products, and the independent variable was health-orientation as the driver or motivation to compromise on taste for health benefits of soy products.

Survey research is popular as surveys are fairly easy to develop, administer, and analyze. While a carefully sampled survey may increase ability to generalize results, it is limited to measurement of self-reported attitudes and behaviours. Therefore, to enrich the data gained from the survey, a focus group method was also employed to evaluate those characteristics of soymilk that could not be evaluated during the survey.

To date, there is still no known substitute for human judgment as an instrument that measures level of acceptability and/or preference for a product or service. In fact, in 1956 "sensory evaluation" was elevated to the realm of "science" (Gatchalian, 1989) through the efforts of the Institute of Food Technologists (IFT). Sensory evaluation is the science of judging and evaluating the quality of a food by the use of the senses i.e. taste, smell, sight, touch and hearing. Sensory testing has been developed into a precise, formal and structured methodology. (Meilgaard et al, 1991).

Qualitative and Quantitative Testing

Sensory consumer studies are used in food and nutrition research to study the effects of different factors related to food acceptance (Schutz, 1999).

Method 1: Quantitative tests determine the responses of a large group of consumers to a set of questions regarding preference or acceptance (Meilgaard 1991). Food acceptance can be verbally operationalized as a measure of rated pleasantness or liking, for which the 9-point degree-of-liking scale is a validated and reliable measure (Cardello, 1996).

Method 2: Qualitative consumer research methods can be used to investigate a wide range of issues and obtain detailed information about consumer attitudes, opinions, perception, behaviours, habits and practices (Chamber and Smith, 1991) Qualitative tests measure subjective responses of a sample of consumers to the sensory properties of

products by having them talk about their feelings in an interview or group setting (Meilgaard 1991). Furthermore, qualitative consumer research methods are useful in defining critical attributes of a product (Resurreccion, 1998). Method 2 is a qualitative affective method.

Method 1: Acceptance test and a questionnaire.

Our objectives are concerned with investigating consumers' attitudes, acceptance and understanding of the diet-health relationship, it is therefore necessary to gather a large amounts of data. The hypothesis to be tested was that health benefit belief is a strong positive determinant of soy milk acceptance in general, and willingness to compromise on taste. To achieve these objectives, an acceptance test and a questionnaire was employed.

In sensory food science, food acceptance is used as a measurable concept that is closely related to food choice. Acceptance refers to an individual experience, a feeling or an emotion with a hedonic aspect (Cardello, 1996). Acceptance of a food is measured in affective sensory tests with potential consumers of the product or service.

The methods most frequently used to quantify acceptance are the tests employing 9-point hedonic scale, where the panelists will rate their liking for a product on a hedonic scale (Ressurection, 1998) where 1 = dislike very much; 9 = like very much. It measures acceptability or liking for a food and it gives an estimate of product acceptance based on the product's sensory properties. (Meilgaard et al, 1991) The unsweetened Alpro soy brand of milk was scored for overall acceptability. Alpro soy milk was selected as it represented the commercially available soymilk on the UK market.

To measure consumers' attitudes and knowledge, a questionnaire was used before subjects scored the soymilk sample. It consisted of questions regarding soy-related food preferences, soy-related knowledge, soy-related consumption, and functional food-related knowledge. Demographic information such as age and gender were also collected.

To fulfil our main aim was to account for less planned or rational decision-making; therefore the outcome measure adopted in this study was people's willingness from the Prototype/Willingness Model (Gibbons & Gerrard, 1998; Gibbons, Gerrard, Blanton & Russell, 1998). It is an alternative outcome measure used in situations which are unfamiliar or involve spontaneous decisions is willingness. Willingness does not relate to what a participant intends to do but rather what they would be willing to do if the situation arose in which there was the opportunity to perform behaviour. Previous literature has revealed that willingness is a more suitable outcome measure than intention when the person is confronted with an unexpected situation and must make a spontaneous decision (Gibbons & Gerrard, 1995, 1997, 1998), or when the person has had less experience of the behaviour (Pomery, Gibbons, Reis-Bergan, & Gerrad, 2009).

Method 2: Focus group discussion

The reason for choosing this method to supplement quantitative data is that "focus group research is useful in gaining insight into consumer's preferences and defining critical attributes of a product. They may also be used in studying consumer habits or attitudes" (Ressurection, 1998). The distinguishing feature of this method is the unstructured approach. Primary interest lies in generating the widest possible range of ideas and reactions (Ressurection, 1998).

2.2 Population and Subjects

The foundation for the research was an extensive literature review to draw together and evaluate the evidence on relationship between organoleptic properties and consumers perception of health benefits of soy milk products**.** The outcomes from this review provided the necessary information to design a structured questionnaire to elicit information on functional food knowledge, attitudes and awareness issues.

The questionnaire was pilot tested on individuals who possessed the characteristics of the target population to eliminate ambiguous terms and confusing items and to make sure that the wording and order gave the best possible results. In that way, words that were confusing, phrases that seemed to have different meaning for different people, and 'leading' questions that seemed to bias people's answers were removed. New questions were inserted as a result of information gained from those 'pilot' questionnaires. A literature search of various books and relevant websites was also carried out as a part of secondary research.

The population studied in this research consisted mostly of residents of Merseyside or surrounding areas, which is generally characterised as an area with a culturally diverse population. Issue of research ethics was addressed prior to data collection for both methods; ethical approval was acquired from the Faculty of Applied Sciences Research Ethics Committee at Chester University.

Prior to recruitment, a sample size calculations were conducted with the use of G*Power 3.1 (Faul, Erdfelder, Buchner & Lang, 2009). A power calculation was performed. The effect size of r=0.29 (statistical significance level of 0.05, power of

80%) is estimated based on the findings of Wu et al. (2005), who also investigated the consumer attitudes regarding the health benefits of soy and their overall acceptance of soymilk yogurt ($r=0.29$; $p<0.0001$). The power used for this study was to be 80%, which means that there is an 80% chance that a true difference will be detected. These figures were inserted into G power software, which calculated a total sample size of 91 subjects (see appendix). In order to allow for a 10% drop out rate, the study aimed to recruit 100 individuals.

Subjects for method 1 were recruited from a convenience sample, from customers in a social enterprise bar/café in Liverpool city centre. Permission from the café/bar was obtained prior to research. Recruitment poster was displayed in the café for participants to see before being approached by the researcher. Each participant was given a consent form prior to their recruitment to eliminate participants with allergy or aversion to soymilk. Subject inclusionary criteria included adults (>18 years old) and exclusionary criteria included no allergy or aversion to soymilk. All participating subjects provided written informed consent. They were selected on the basis of time availability, ease of their volunteering, interest, attitude, no allergy or aversion to soy products, willingness to participate and easy access. The advantages of this type of sampling were the availability and the quickness with which data was gathered. The disadvantages were the risk that the sample might have not represented the population as a whole, and it might have been biased by volunteers.

The original target of 100 questionnaires was not reached and 82 questionnaires were collected in total. This could be viewed as small in terms of survey research, but limitation to this level was necessary as tasting of a food material (i.e. soy milk) was

also included, with the ensuring practical difficulties involved in serving large numbers of samples.

Participants for method 2 were selected from a random sample of subjects who participated in the first stage of this research (survey - method 1). The participants were those who completed the questionnaire indicated by their signature if they were interested in taking part in a focus group study. Subjects were already informed on what to expect as the researcher explained the purpose at the end of the questionnaire in method 1. By having participated in the survey and expressing an interest in participating in the focus group, their involvement implied being pre-selected on the basis of time availability, interest, attitude, no allergy to soy, any aversion to soy products and willingness to participate. The researcher selected 7 people to make up the group by using the systematic random sampling method, where the researcher first randomly picked the first subject from the population (i.e. questionnaire respondents who were willing to partake in the focus group).

Then, the researcher selected each fourth subject from the list. The main advantage of using this type of sampling was its simplicity. It allowed the researcher to add a degree of system or process into the random selection of subjects. Another advantage was the assurance that the population would be evenly sampled. Permission from the bar had been obtained (see Appendix 9). Each participant was given a PIS and consent form prior to their recruitment (see Appendix 3 and 4). None of the subjects were paid for participating. Participants in method 2 were reimbursed for the cost of travel and were served refreshment after the session. They were also given a gift card from a local supermarket.

2.3 Procedure.

Method 1: Data for the acceptance test and the questionnaire was collected from a convenience sample, from customers in a social enterprise bar/café in Liverpool city centre. A poster was displayed in the café for participants to see before being approached by the researcher. The researcher was available to conduct the survey at least once a week for 2 - 3 hours each time between September 2012 and October 2012. In a café, customers had some free time on their hands and they willingly took part in the study. Participants were first asked to complete a questionnaire. Afterwards, they tasted a soymilk sample given to them by the researcher to express their overall acceptance and liking of soy milk on a nine-point hedonic scale. Participants were consumers, who were "naive" in that they had no training in sensory analysis, sampled the product and expressed their overall acceptance and liking of soymilk. Samples were presented for analysis in 2oz (60ml) plastic cups at 21° C. Subjects were also given unsalted plain crackers and a room-temperature drinking bottled water. Each questionnaire and sampling took approximately 5 minutes to complete.

All questionnaires were reviewed by the researcher to ensure completeness and address any questions raised by the subjects. On completion, they received a soy factsheet as an educational tool and a 'thank you'. Subjects participating in the survey were also given an opportunity to participate in the focus group (indicated in the end section of the questionnaire, see Appendix 1) and of those interested, 7 were selected.

Method 2: The focus group was held in the conference room in a social enterprise bar/café in Liverpool city centre, which was determined to be a reasonably convenient location for the participants. Participants were provided with seating in a quiet, well-lit,

odour-free area, free from distracting noises. The chairs and a table were set up in the room in a circle to encourage open discussion.

The session was conducted following standard practice for moderating and documenting focus groups. A discussion took place, where a prompt list was followed that allowed a certain amount of latitude in the discussion, but maintained an overall structure. The researcher conducted the discussion by asking participants a series of open-ended questions related to the main topics. These questions and probes were inspired from the studies of Tue et al. (2012) and Schyver and Smith (2005) and combined with questions adapted from a questionnaire used in method 1. The discussion points and themes for this semi-structured group session are included in appendix A. Towards the end of the discussion; a tasting session was implemented to define critical attributes of the soymilk. Samples were presented for tasting in 2oz (60ml) plastic cups at 21o C. Subjects were also given unsalted plain crackers and a room-temperature drinking bottled water.

2.4 Data Management and Analysis:

Method 1: Statistical computer package IBM SPSS (v21) was used for summarizing and describing the data collected. Questionnaires were checked for completeness before analysis. Descriptive statistics were calculated for all survey questions. Information collected was converted into continuous data. Chi square analysis was used to evaluate the existence of relationship between willingness to compromise on taste for health and non-numerical variables including those related to demographics, gender, general health and the level of knowledge on soy products. A p-value of ≤ 0.05 was considered statistically significant.

Method 2: Audio-recorded conversation of the focus group was fully and accurately transcribed using verbatim. The transcription was divided into logical and meaningful segments using content analysis, as described by Graneheim & Lundman (2004). The transcribed texts were read several times and sentences and paragraphs were identified in relation to the research question. After condensation, meaning units were grouped into themes and sub-themes. Words, sentences or paragraphs containing related aspects through their content and context were classified into sub-themes and themes. The transcripts were analysed using Microsoft Word, as suggested by Krueger & Casey (2000) who advocate the use of a computer-based approach for cutting, pasting, sorting, arranging and rearranging data through comparing and contrasting the relevant information.

CHAPTER 3: Results

3.1 Questionnaire Results:

3.1.1 Demographic Information:

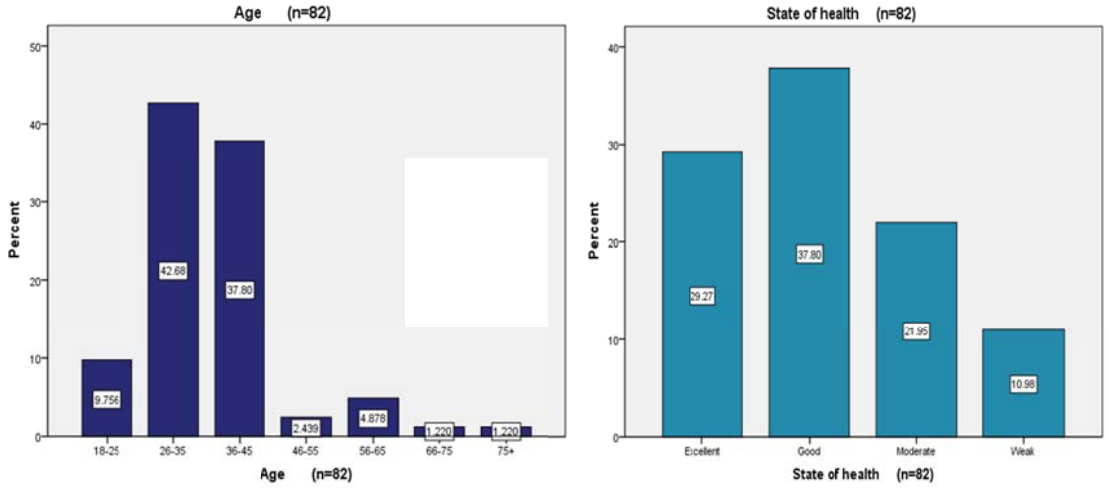

Figure 2: Age and state of health of survey participants

Out of 82 survey participants, the majority were between 26-35 years old. Over a third of subjects have described their health as good, followed by those who viewed their health as excellent, moderate and weak.

3.1.2 Knowledge on Functional Foods and Soy Products.

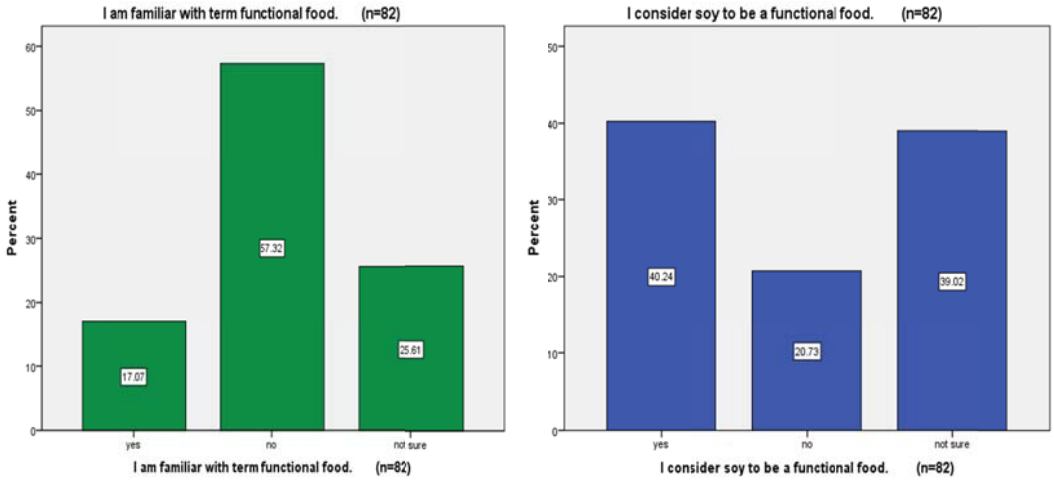

Figure 3: Familiarity with the term functional food and with soy as a functional food.

Although a majority were not familiar with the term functional food, a large number of participants considered soy to be one.

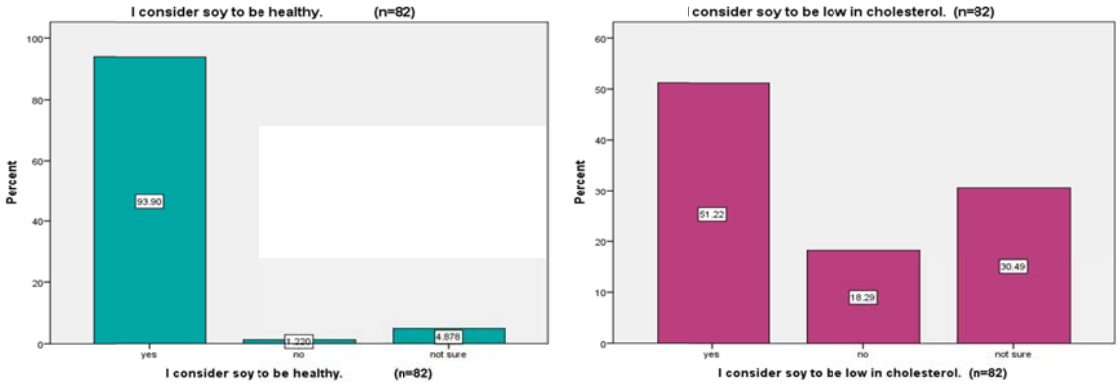

Figure 4: Soy is healthy and low in cholesterol

Most of survey respondents considered soy to be healthy and half knew that soy was low in cholesterol.

Table 1: Specific knowledge questions about the health properties of soy.

Statement	Yes (%)	No (%)	Not sure(%)
I consider soy has cholesterol lowering effect	24	16	60
I consider soy can decrease osteoporosis	7	11	82
I consider soy can reduce the risk of heart disease	54	26	21
I consider soy helps reduce the risk of prostate and breast cancer	12	36	52
I consider soy can prevent chronic nose bleeds	2	34	64

Participants' actual knowledge on healthiness of soy in general was quite limited.

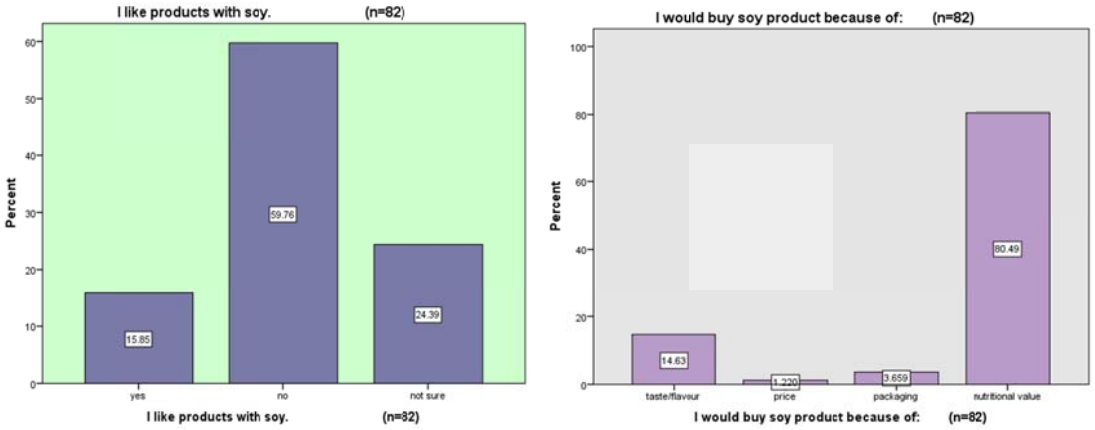

Figure 5: Liking of soy products and reasons for possibly buying them

More than half of the subjects did not like products with soy. Only a minority would buy them for their taste/flavour properties as opposed to a majority who would buy them because of their nutritional value

3.1.3 Soy consumption intensions and likelihood of buying soy products

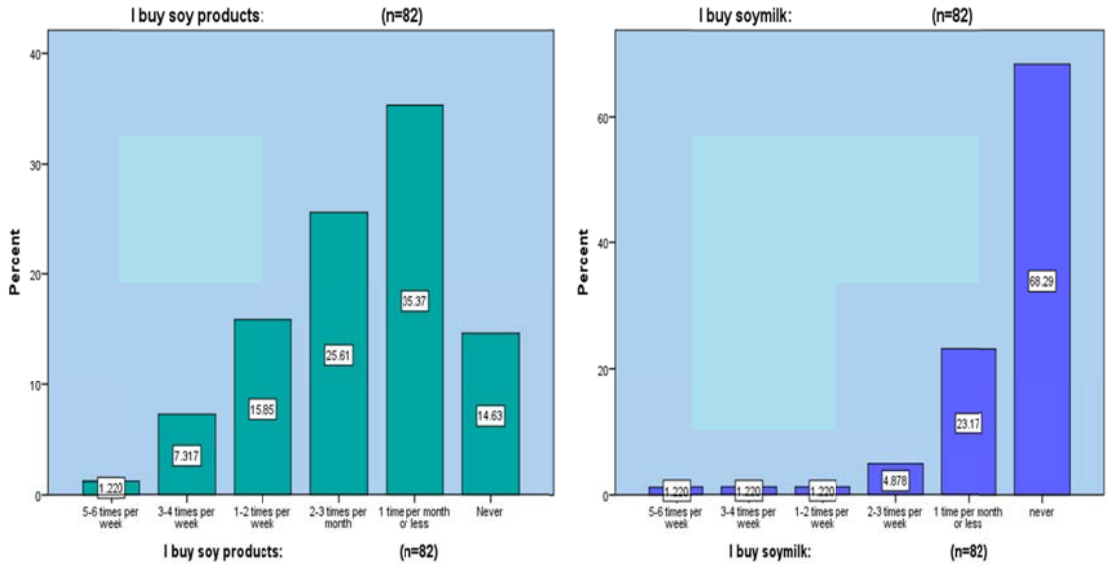

Figure 6: Frequency of buying soy products and soy milk.

Soy products in general were preferred over a soymilk as it can be seen in the frequency pattern of buying soy products which was higher than that of soymilk.

3.1.4 Attitudes towards soymilk

Table 2: Cross-tabulation: I like the taste of soymilk vs. Soymilk has an aftertaste

		Soymilk has an aftertaste. (n=82)			Total
		yes	no	not sure	
I like the taste of soymilk. (n=82)	yes	0	24	4	28
	no	29	0	0	29
	not sure	0	0	25	25
Total		29	24	29	82

An association between liking the taste of soymilk and belief that soymilk has an aftertaste was found to be statistically significant ($p<0.001$) (table 5). As one would expect, subjects that liked the soymilk did not think it had an aftertaste and vice versa. Subjects who were not sure about whether they liked the soymilk, felt the same way about the aftertaste. (The value $p \leq 0.05$ refers to a significant relationship, or difference, between two or more variables (for example attributes of a product) which will occur 95 times out of 100).

Table 3: Cross-tabulation: I like the taste of soymilk vs. soymilk tastes worse than dairy milk

		Soymilk taste worse than dairy milk. (n=82)			Total
		yes	no	not sure	
I like the taste of soymilk. (n=82)	yes	3	21	4	28
	no	28	1	0	29
	not sure	13	0	12	25
Total		44	22	16	82

A similar association was found ($p<0.001$) between belief that soymilk taste worse than dairy milk and liking the soymilk's taste. Subjects liking the taste of soymilk did not think it tasted worse than dairy milk. Similarly, those who did not liked the soymilk taste thought it had a worse taste than dairy milk.

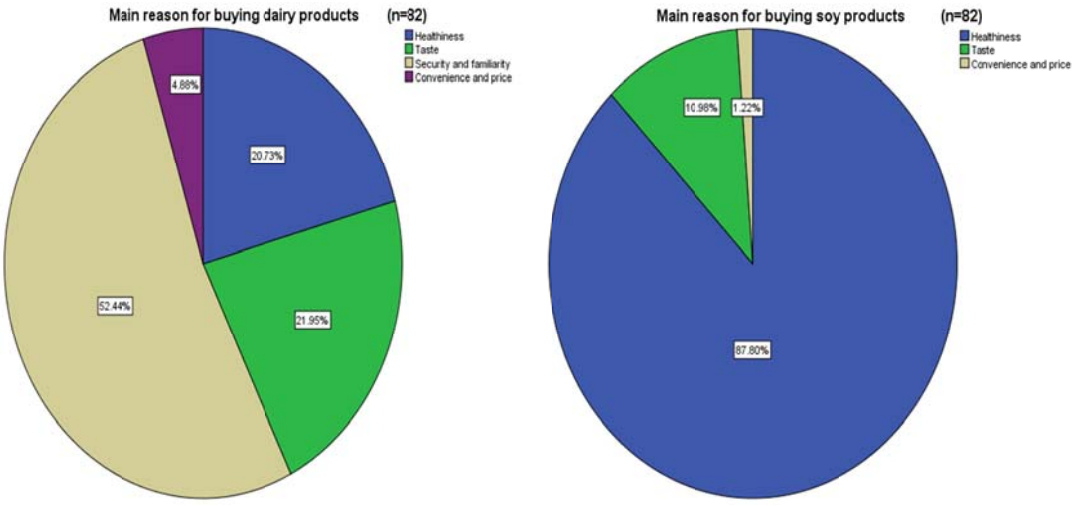

Figure 7: Differences between reasons for buying dairy products and soy products.

A large number of subjects reported healthiness as a reason for buying soy products and only a minority bought them because they liked the taste. However, when buying dairy products, it was security and familiarity that half of our subjects gave as a main reason for purchasing dairy products.

Figure 8: Likelihood of buying soymilk product when it's believed to be healthy

Table 4: Cross-tabulation: Likelihood of buying soymilk product when it's believed to be healthy vs. liking the taste of soymilk.

		I like the taste of soymilk. (n=82)			Total
		yes	no	not sure	
If soy product is healthy(/ier than conventional dairy product), I would: (n=82)	Definitely buy it	15	0	0	15
	Probably buy it	9	4	20	33
	Maybe buy it	0	8	0	8
	Probably not buy it	4	16	5	25
	Definitely not buy it	0	1	0	1
Total		28	29	25	82

A significant relationship ($p<0.001$) between liking the taste of soymilk and likelihood of buying it based on the knowledge it was healthy (or healthier than a conventional dairy product) was found. For example, respondents who did not like the soymilk taste would probably not buy it even if they believed it was healthy. Also, subjects already keen on soymilk taste would definitely buy it knowing it offered them a health benefit.

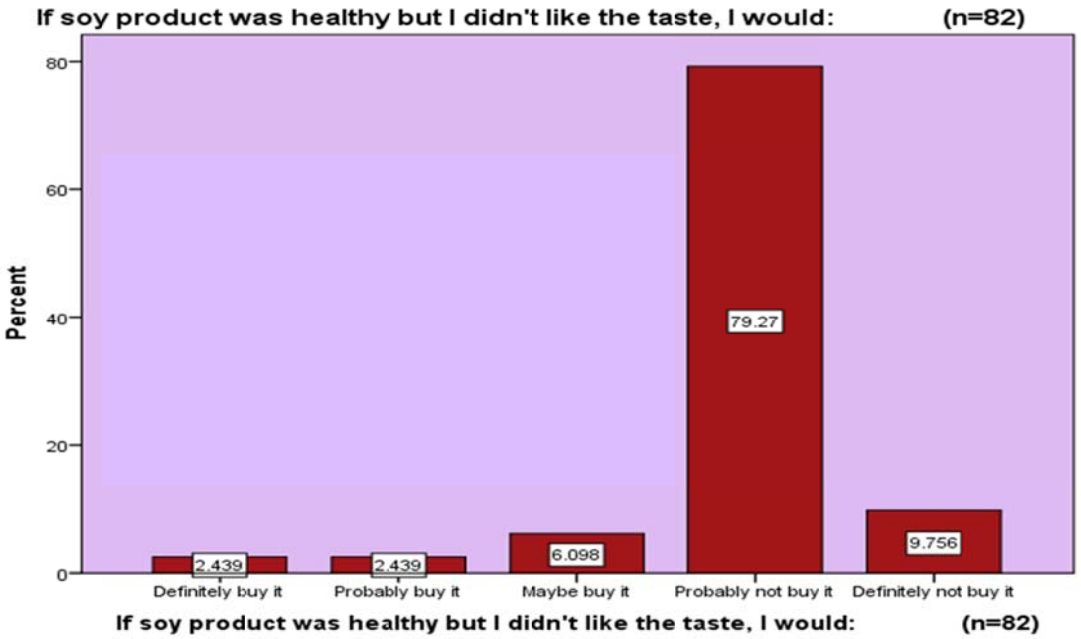

Figure 9: Likelihood of buying soymilk product when not liking the taste, even though it's believed to be healthy.

A great majority of people reported "probably not buying" soymilk believing it was healthy but not liking the taste.

Table 5: Cross-tabulation: Likelihood of buying soymilk product when not liking the taste, even though it's believed to be healthy vs. Soymilk has an aftertaste.

		Soymilk has an aftertaste. (n=82)			Total
		yes	no	not sure	
If soy product was healthy but I didn't like the taste, I would: (n=82)	Definitely buy it	0	2	0	2
	Probably buy it	0	2	0	2
	Maybe buy it	1	4	0	5
	Probably not buy it	22	16	27	65
	Definitely not buy it	6	0	2	8
Total		29	24	29	82

An association was found (p=0.003) between subjects' position on whether soymilk has an aftertaste and likelihood of buying it believing it was healthy but not liking the taste. It was subjects that were not sure about soymilks' aftertaste and those thought it had an aftertaste that reported "probably not buying" it if they did not like the taste, despite the health benefits offered.

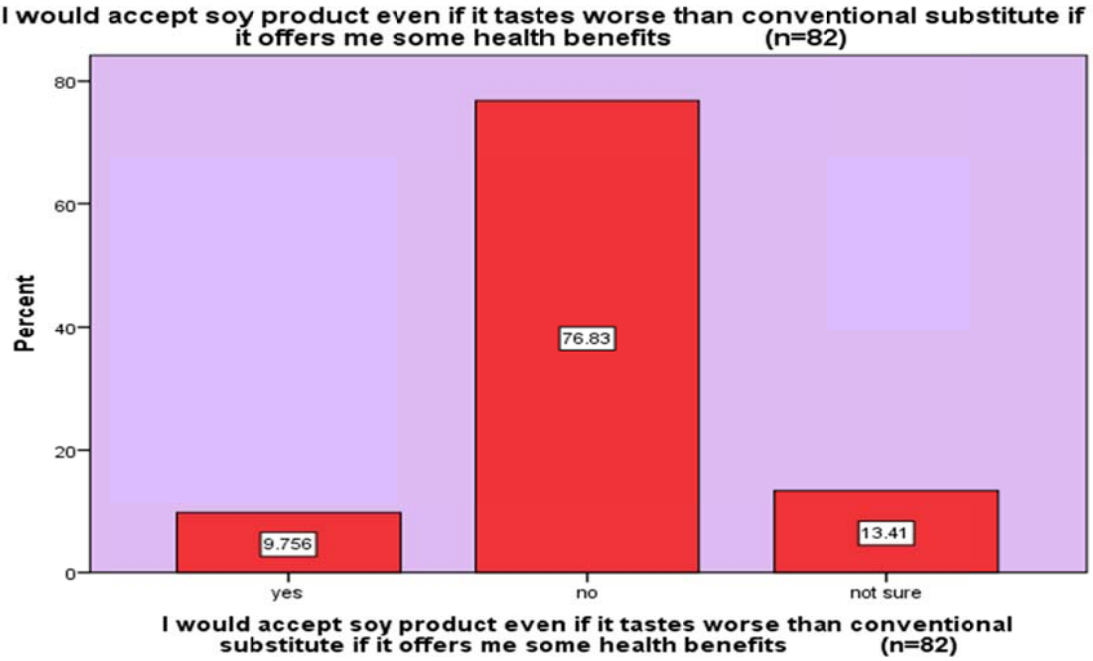

Figure 10: Acceptance of soymilk product tasting worse than its conventional substitute if it offers me some health benefits.

More than ¾ of our participants would not accept soymilk product with health benefits tasting worse than its conventional substitute.

Table 6: Cross-tabulations: Soymilk has an aftertaste and tastes worse than dairy milk vs. I would accept soy milk product even if it tastes worse than conventional substitute if it offers me some health benefits

		Soymilk has an aftertaste. (n=82)			Total
		yes	no	not sure	
I would accept soy product even if it tastes worse than conventional substitute if it offers me some health benefits (n=82)	yes	0	8	0	8
	no	24	14	25	63
	not sure	5	2	4	11
Total		29	24	29	82

		Soymilk taste worse than dairy milk. (n=82)			Total
		yes	no	not sure	
I would accept soy product even if it tastes worse than conventional substitute if it offers me some health benefits (n=82)	yes	2	6	0	8
	no	34	14	15	63
	not sure	8	2	1	11
Total		44	22	16	82

Chi-square test revealed a significant relationship ($p<0.001$) between standpoint on whether soymilk has an aftertaste or not and acceptance of soymilk products tasting worse than conventional substitute but offering health benefits.

Subjects not willing to compromise on taste for health were those who though soymilk had an aftertaste and those who were undecided on soymilk's aftertaste.

Similarly, subjects not willing to compromise on taste for health were mostly those who thought that soymilk tasted worse than dairy milk and those who were undecided ($p=0.014$).

3.1.5 Sensory Analysis of Soymilk, Acceptance Test

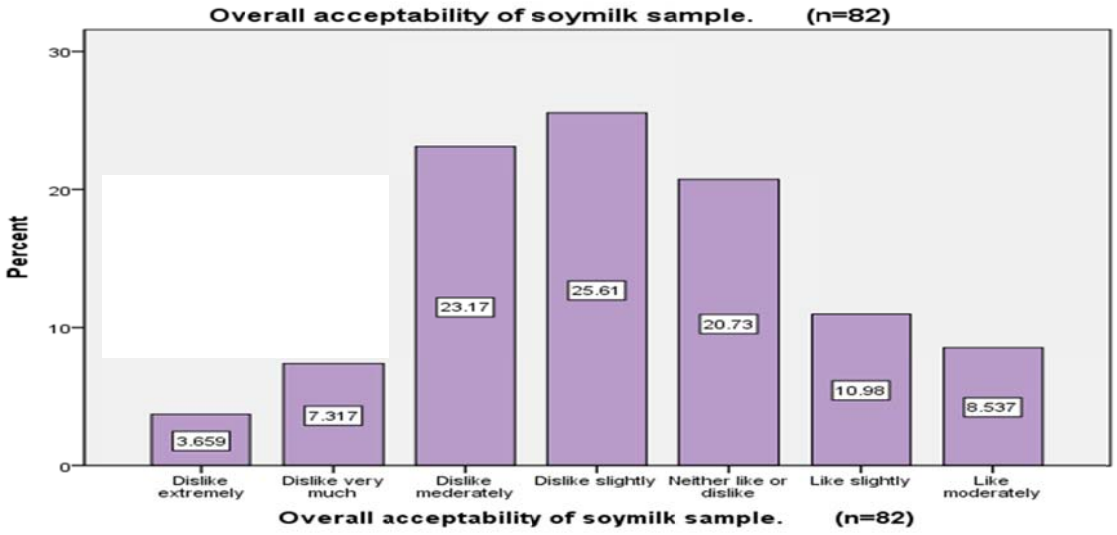

Figure 11: Overall acceptability of soymilk sample

A majority disliked the sample slightly, moderately, very much and extremely, the rest were undecided and liked it slightly, moderately and very much.

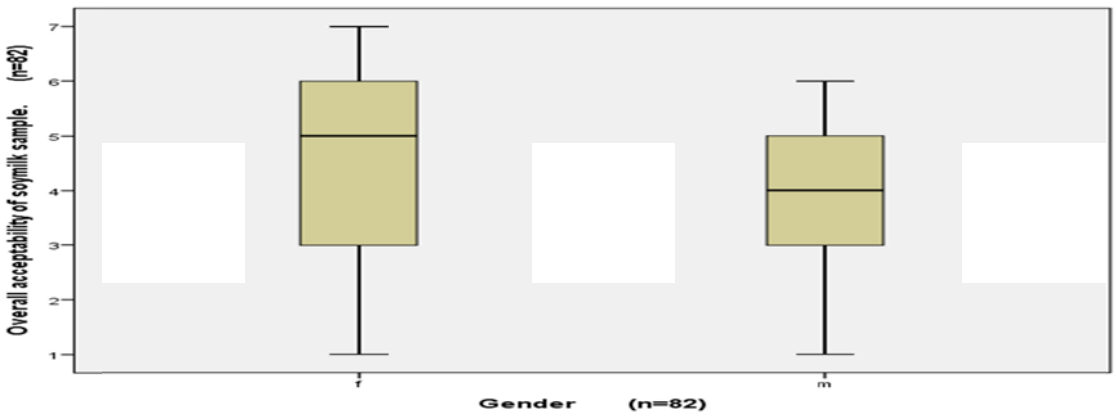

Figure 12: Overall acceptability of soymilk sample and gender

There was a significant difference in the overall acceptability as a function of gender (p=0.003) where male subjects had lower acceptance ratings than females. The difference is that male's average overall acceptability of soymilk sample was 3.77(where 1- dislike extremely, 9-like extremely) with an interquartile range (IQR) 2, whereas female's average overall acceptability was 4.67, IQR 3.

3.2 Main Findings from the Focus Group Discussion:

The focus group consisted of 7 participants between 25 and 45 years of age: 4 men and 3 women. Out of those 7 participants, only 3 were familiar with the term "functional foods". Interestingly, all 3 were females and interested in healthy eating. They also reported shopping for the household more often than males. Those 3 subjects, however, were not regular consumers of functional foods, they view them as being more expensive when compared with conventional foods. Following themes emerged during the discussion: attitudes towards functional foods, price and functional foods, price and soy products, health knowledge and soy products, taste of soy products, nutrition knowledge and soy acceptance, willingness to compromise on taste of soy for health.

3.2.1 Attitudes Towards Functional Foods

* "I guess functional foods are meant to be different to normal foods, they have something extra written on packaging and that makes them dearer, not sure why." (female, 35)

* "I know that those special yoghurts are good for your digestive system, but I can't really afford Yakult, it is expensive." (female, 26)

* "I only buy them when supermarkets are doing buy one get one free. Otherwise they are a bit expensive for me." (female, 23)

3.2.2 Price and Functional Foods

Other subjects did not express much enthusiasm about paying extra for functional foods.

* " If they were priced the same as regular foods then naturally I'd choose the one that claimed to be healthier, but if they cost a few pounds more just for a claim I don't even understand, I don't think I'd spend any extra money." (male, 45)

* "If there was a small price difference, I'd probably buy them." (female,35)

* "I am largely put off by price of those so called functional foods; don't really think it's necessary to add them to my diet, unless they go down in price." (male, 22)

* "I've heard about some super foods that can improve your health but if there is nothing wrong with my health, they are not necessary for me to buy them, especially when they are so pricey." (male, 37)

3.2.3 Price and Soy Products

There appeared to be even smaller willingness to pay extra for soy products, mainly due to their bad taste. Most participants were aware of what soy products are on the market and they quoted 'soymilk, soy yoghurt, tofu, soy dressing, soy nuts, soy sauce, soy burger, soy sausages and soy ice cream' as soy products. 3 participants recognised soy as functional foods as well.

* "Soy products look, smell, and taste terrible. I wouldn't buy them even if they were half the price of conventional products." (male, 37)

* " I would spend the extra £1 if they tasted anything like dairy products, but they don't. My daughter does though, but she's a vegetarian." (male, 43)

* “I’ve bought a soy mince once or twice thinking it was healthy, but I just couldn’t get used to the taste. And it wasn’t cheap either. I do have a chocolate flavour soymilk in my coffee sometimes at home, but it’s expensive in places like Starbucks .”(female, 23)

* “Aren’t soy products mainly for vegetarians? I guess they like them because they don’t know what meat tastes like, you don’t miss what you don’t have. They also save money on not buying meet so they can afford these fancy soy burgers and sausages.” (male,22)

3.2.4 Health Knowledge and Soy Products

Much of the debate over willingness to pay for soy products focused on whether they provided a proven health benefit.

* “If I know soy is actually gonna do something for my health, then I suppose I could spend a bit more money. But how do I know they are? Because the ad says so? You can’t trust anyone these days.”(male, 22)

* “How can I believe the TV ads about the health benefits when they are only concerned with making profit?”(female, 35)

Two females were aware of those health benefits.

* “There has been stuff on soy on TV, I remember this ad on soymilk being low in cholesterol so I guess soy must be healthy.” (female, 23)

* “I know that soy is good for your heart; a saw a claim on a soymilk carton. I bought it once to go on my cereals.” (female, 26)

3.2.5 Taste of Soy Products.

Opinions about taste of soy products varied considerably among participants. Most of them agreed that soy foods taste bland and flavourless, while others described the soy products as strong and unpleasant.

* “My daughter is a vegetarian and buys lots of those soy ready-made meals. I think they are bland and boring; they don’t taste anything like the real food.”(male, 43)
* “Once a bought a soy yoghurt, it was awful, it had a distinctly non-dairy flavour, very raw like, almost like uncooked lentils.”(female, 35)
* “My ex-girlfriend used to drink soymilk, it looked sort of thick and beige and unfortunately I tasted it. Horrible taste! Disgusting aftertaste, very strong. Never again!” (male, 22)
* “I don’t think soymilk is that bad, a bit bland maybe but with cereals it’s ok.” (female, 26)
* “I'm personally a fan of chocolate soymilk, and if you substitute it for dairy in a Starbucks coffee, you'll hardly notice the difference. Yet taken straight, soymilk is awful, tastes a bit vegetabley.” (female,23)
* “Soymilk? I wouldn’t buy it even for my cat.”(male, 37)
* “I agree, soymilk is nasty but I like the taste of soy sauce, that’s a soy product, isn’t it?”(male, 45)

3.2.6 Nutrition Knowledge and Soy Acceptance.

However, when participants were informed on health benefits of soy to find out if nutrition education can actually change their perceptions, they responded:

(soy fact sheet was given to each participants, information on soy health benefits included facts like cholesterol lowering effect of soymilk and its role of heart disease)

* “For people with high cholesterol, like my husband, soy products are probably a good idea. I might consider buying them actually.” (female, 35)
* “If I was sure that these soy products were doing the same as the tablets I am taking I would probably swap, they are more natural than tablets after all.” (male,45)
* “Well, now that you’ve showed me that leaflet, I’m a bit more open to the idea that they can improve my health, but buying them? That’s another story.”(male, 22)
* “Prevent cancer? Oh, I wasn’t aware of that. I wouldn’t mind trying more soy foods; we’ve had two cancers in our family. You hear so much about cancer these days, it makes you really scared.” (female,23)

However, one subject was sceptical about soy providing the same benefits as his medication. His concern was difficulty in determining the amount of food needed to provide the health benefits.

* “When I take a pill I know it’s 5mg that I need, but if I was to drink soymilk instead, then I wouldn’t know how much I need to actually drink to get the same effect as the pill.”(male, 45)

3.2.7 Willingness to Compromise on Taste of Soy for Health.

Towards the end of the discussion, participants were asked to taste an unflavoured soymilk sample, already being informed on soy health benefits. They were then asked if

they liked the sample and if not, “would the health benefits outweigh their negative taste perceptions?”

* “I just can’t get pass that grainy, vegetabley taste, I would prefer a flavoured soymilk.”(female, 23)

* “ It’s just too bland, might be ok in cooking though.”(male,43)

* “It’s not that bad to drink it, it’s rather nice, nutty like, I suppose you could get used to this taste if you know it’s good for you. But I would still only have it with my cereals.” (female,26)

* “This taste just brought bad memories back, of a soymilk and my ex! No way would I trade it for normal milk.” (male,22)

* “I’d rather buy a vitamin pill if I wanted my health improved.” (male, 37)

* “Some soy foods are quite ok, tofu tastes a lot nicer than this milk. If tofu wasn’t so expensive, I’d buy it just to get that extra iron. I don’t think I’d buy soymilk though, no matter how healthy it is. It’s too thick and yellowish and it definitely isn’t milk. Real milk is so much nicer.” (female,35)

* “I think I’m gonna stick to my Simvastatin (cholesterol lowering pills). I just couldn’t get used to this taste. Why torture my taste buds if I don’t have to?” (male,45)

CHAPTER 4: Discussion

This discussion combines data from both methods employed in the study. The combination of focus group and consumer survey with sensory methods proved a useful tool in guiding research efforts to better understand the characteristics that influence consumers' acceptability of soymilk.

4.1 Demographics.

Out of 82 survey participants, the majority were between 26-35(43%) followed by 36-45 (38%) and 18-25(10%) age bracket, and 46+ category representing remaining 9%. Over a third of subjects (38%) have described their health as good, followed by 30% who viewed their health as excellent, further 22% as moderate and only 11% of participants as weak. Half of the subjects were single without child/children (50%), followed by single with child/children (21%), then married with child/children (17%) and lastly married without child/children (12%).

Gender was equally distributed, with 39 females and 43 of males. The focus group had similar characteristics: gender balance in a group (4 males and 3 females), and selection of people from different age groups (between 22-45years of age).

4.2 Knowledge on Functional Foods and Soy Products

Both survey and focus group participants demonstrated an uneven knowledge of functional foods and soy foods in particular. Out of 7 focus group subjects only 3 were familiar with the term "functional foods", having seen functional foods advertised on

television (Yakult, soymilk). Similarly, more than half of the survey subjects (58%) were not familiar with the term “functional food”.

However, more than a quarter (40%) of survey subjects considered soy a functional food, which concurred with the focus group (3 out of 7). On the other hand, most focus group subjects were sceptical whether they provided a proven health benefit, and majority of survey participants were vague about the details of those health benefits.

That limited knowledge together with the fact that functional foods were seen as too expensive to warrant purchase has resulted in a low willingness to accept them: There was a perception that functional foods were too expensive to add to add to regular shopping, especially if people are already eating a balanced diet.

“I am largely put off by price of those so called functional foods; don’t really think it’s necessary to add them to my diet, unless they go down in price.”(male, 22)

“I’ve heard about some super foods that can improve your health but if there is nothing wrong with my health, they are not necessary for me to buy them, especially when they are so pricey.” (male, 37)

It appears that participants’ actual knowledge on healthiness of soy in general was quite limited. 94% of survey respondents believed that soy was healthy, which compares to the United Soybean Board 2007 Annual National Report in which more than 85% of consumers rated soy products as healthy as well as 63% of respondents in Real Eat Survey UK (2001).

Although soy was believed to be healthy and 51% knew that soy was low in cholesterol, a majority were not sure about its cholesterol lowering effect (60%), soy decreasing

osteoporosis (82%), soy reducing the risk of certain cancers (52%) and soy preventing chronic nose bleeding (64%). The only health property of soy that 54% of subjects recognised was the soy's ability to reduce the risk of heart disease. Interestingly, that knowledge was much higher amongst females (p=0.002). Similarly, in the focus group, it was only females (n=2) that were aware of health benefits of soy, which is consistent with literature reporting that females are better educated consumers. (Childs and Proyzees, 1998)

4.3 Attitudes towards Soy Products.

More than half of the survey subjects (60%) did not like products with soy. Similar opinions were expressed in the focus group; in fact, their reasons were very much attributed to the taste (reported as either bland and flavourless or strong and unpleasant). Those negative taste perceptions were also given as a reason for not purchasing soy product. Although price was an important factor in the participants' purchasing decision process, highlighted by most focus group participants, taste still emerged as the most dominating factor. One male went as far as saying that even if soy products were half of the price of conventional products, he would still not buy them as "they look, smell, and taste terrible". The fact that taste was viewed as more important than price is not surprising as "Taste has been constantly reported as a major influence on food behaviour" (EUFIC, 2005).

The fact that purchasing behaviour of soy products is greatly influenced by taste was also confirmed in the survey. Only 15% 'would choose buying' soy products for their taste/flavour properties as opposed to 80% who would buy soy products because of their nutritional value, which is not surprising since we already know that 94% of survey

respondents believed that soy was healthy. Similarly, when survey subjects were asked why they 'actually buy' soy products a large number (88%) of subjects reported healthiness as a reason for buying soy products and only 11% bought them because they liked the taste. This finding disagrees with McIsaac et al. (1993) who reported that flavour (89%) was the most important factor in the decision to buy soy-containing products, followed by perceived health benefits of a product (64%).

However, only 21% reported healthiness to be the reason when buying dairy products. It was security and familiarity that 52% of our subjects gave as a main reason for purchasing dairy products, followed by taste (22%) and convenience and price (5%).

4.4 Soy Consumption Intensions and Likelihood of Buying Soy Products

In any case, soy products in general were preferred over a soymilk as it can be seen in the frequency pattern of buying soy products which was higher than that of soymilk. Over a quarter (26%) of survey respondents bought soy products 2- 3 times a month whereas soymilk was bought 2-3 times a month only by 5%. Two focus group participants expressed a very similar preference for soy products over soymilk: "Some soy foods are quite ok, tofu tastes a lot nicer than this milk. If tofu wasn't so expensive, I'd buy it just to get that extra iron. I don't think I'd buy soymilk though…" (female,35).

"… soymilk is nasty but I like the taste of soy sauce…"(male, 45).

The fact that soymilk was only bought once a month or less by 23 survey respondents and it was bought mainly to use in tea/coffee (43%) and to be had with breakfast cereals (24%) suggests that consumers are not particularly enthusiastic about buying soymilk

on a regular bases, however, when it's bought once in a while, it's mostly to use in coffee or cereals for it to be acceptably palatable. Only 10% bought it to drink.

In fact, this was very much confirmed in the focus group discussion, where the only 2 participants who buy soy milk stated that they only bought it to use in coffee or with cereals:

"I do have a chocolate flavour soymilk in my coffee sometimes at home... if you substitute it for dairy … you'll hardly notice the difference. Yet taken straight, soymilk is awful". (female, 23)

"I don't think soymilk is that bad, a bit bland maybe but with cereals it's ok."(female, 26)

However, the questionnaire did not specify whether the soymilk was plain or flavoured and therefore these results should be interpreted with caution.

When subjects were asked whether they would buy more soy products knowing of their specific associated benefits, 44% would increase their soy purchasing and only 9% would not. This agrees with the hypothesis by Babb (2002) (cited in Wu et al, 2005) that "increase in consumer awareness of the health benefits of soy foods in the recent years may contribute to increased soy consumption." This awareness was seen in half of our survey subjects (54%) who recognized that soy may reduce the risk of heart disease.

4.5 Attitudes towards Soymilk

When survey subjects were asked about their perceived liking of soymilk in general (without tasting), results were very different from acceptability tests. 35% said no, 34% yes and 30% were not sure whether they liked soymilk or not. Similarly, more than a third (35%) thought it had an aftertaste, 29% did not think that and 35% were not sure.

An association between those attitudes was found to be statistically significant ($p<0.001$). As one would expect, subjects that liked the soymilk (n=24) did not think it had an aftertaste and vice versa (n=29). Out of 29 subjects who were not sure about whether they liked the soymilk, 25 felt the same way about the aftertaste. That significance can also be seen in a comment made by a focus group participant who did not like the taste of soymilk and also thought it had an aftertaste: "Horrible taste! Disgusting aftertaste, very strong!"(male, 22)

Based on reports of low soymilk acceptance in literature as well as self-reported negative attitudes towards soymilk highlighted earlier, one would expect participants disliking the soymilk sample rather than liking it. Indeed, sensory test proved that. Results from acceptability test showed that our subjects disliked the sample considerably more based on tasting, whereas previous results were based on survey subject's perceived liking. It can be speculated here that our subjects either allowed their negative taste expectations of soy influence their actual flavour perception, hence scoring the soy sample less favourably or they swayed their decision based on a negative taste attributes of soymilk reported in previous studies.

Sensory results showed that the majority (60%) disliked the sample slightly, moderately, very much and extremely, 21% were undecided and 19% liked it slightly, moderately and very much. Unlike age or state of health, subjects' overall acceptability of the sample was influenced by gender. There was a significant difference in the overall acceptability as a function of gender ($p<0.001$) where male subjects had lower acceptance ratings (3.8) (IQR 2) than females (4.7) (IQR 3), (where 1- dislike extremely, 9-like extremely).

Since the questionnaire did not include a question on the reasons behind liking or disliking the sample, one has tried to infer what some of those reasons might be from the method 2 results. Focus group participants commented on soy taste which could help explain the reasons behind liking/disliking of soymilk in general. Comments included:

"… too thick and yellowish and it definitely isn't milk" (female,35)

"…soymilk is awful, tastes a bit 'vegetabley'. (female,23)

"…grainy taste…"(female,26)

"I agree, soymilk is nasty…"(male, 45)

"Horrible taste! Disgusting aftertaste, very strong…"(male,22)

"I don't think soymilk is that bad, a bit bland maybe..."(female, 26)

A majority (65%) of survey subjects believed that soymilk tastes worse than dairy milk. An association was found ($p<0.001$) between belief that soymilk taste worse than dairy milk and liking the soymilk's taste. Subjects liking the taste of soymilk (n=21) did not think it tasted worse than dairy milk. Similarly, those who did not liked the soymilk taste (n=28) thought it had a worse taste than dairy milk. This association was also noticed in the focus group discussion:

"I don't think I'd buy soymilk though, no matter how healthy it is. It's too thick and yellowish and it definitely isn't milk. Real milk is so much nicer."(female,35)

4.6 Nutrition Knowledge and Soy Acceptance

One of the hypotheses in this research was that the overall liking of soy products will be higher when participants believe that soy foods are beneficial to their health. Survey

data found no association between liking the taste of soymilk and belief in soy's health properties. In fact, out of 77 subject who believed that soy is healthy, more (n=28) reported not liking the taste than liking it (n=24). Although no such association was found, when survey participants were asked how likely they were to buy soymilk knowing it was healthy (or healthier than conventional dairy product), a larger number (40%) said that they would probably buy them.

This indicates that greater knowledge does not increase liking for soymilk. It does however suggest that probability ('would probably buy them') of buying them is higher when consumers believe the soymilk is healthy (or healthier than conventional dairy product). Furthermore, knowledge that the soymilk is healthy also influenced the purchasing behaviour of those who were not even sure if they liked the taste of soymilk (n=20).

A significant relationship ($p<0.001$) between liking the taste of soymilk and likelihood of buying it based on the knowledge it was healthy (or healthier than a conventional dairy product) was found. For example, 16 respondents who did not like the soymilk taste would probably not buy it even if they believed it was healthy. Also, 15 subjects already keen on soymilk taste would definitely buy it knowing it offered them a health benefit.

In the focus group, information about soy health benefits also had an effect on likelihood of consumption:

"For people with high cholesterol, like my husband, soy products are probably a good idea. I might consider buying them actually." (female, 35) "If I was sure that these soy

products were doing the same as the tablets I am taking I would probably swap, they are more natural than tablets after all." (male,45)

"...I wouldn't mind trying more soy foods, we've had 2 cancers in our family.(female,23)

These finding are consistent with the results of Tuorila et al. (1998) who found that nutritional knowledge and information had a clear effect on purchase interest, but less impact on the pleasantness of food.

However, all the above results only tell us about a higher purchase interest and liking/disliking of soymilk when consumers believe the soymilk is healthy. How would those purchase intensions change when consumers (knowledgeable on soy benefits) don't like the soymilk taste is discussed bellow.

In contrast to the above finding, when survey subjects were questioned about likelihood of purchasing soymilk believing it was healthy but not liking the taste, a great majority of people (79%) reported "probably not buying it". 10% would definitely not buy it and only 6% would consider buying it. This concurs with findings from study by McIsaac et al. (1993) who reported that flavour (89%) was the most important factor in the decision to buy soy-containing products, followed by perceived health benefits of a product (64%).

An association was found ($p=0.003$) between subjects' position on whether soymilk has an aftertaste and likelihood of buying it believing it was healthy but not liking the taste. It was subjects that were not sure about soymilks' aftertaste ($n=27$) and those thought it had an aftertaste ($n=22$) that reported "probably not buying" it if they did not like the taste, despite the health benefits offered. However, likelihood of purchasing soymilk

(believing it was healthy but not liking the taste) only tells us how likely consumers are to buy the product. Once the product is bought, it might or might not be accepted. To address the question of acceptance, survey subjects were asked: Would you accept soy milk product even if it tastes worse than conventional substitute if it offers you some health benefits?

4.7 Willingness to Compromise on Taste of Soy for Health.

More than ¾ of our participants (77%) would not accept soymilk product with health benefits tasting worse than its conventional substitute, followed by 16% who would accept it and 13% who were not sure. In addition, a majority of our focus group subjects were not willing to compromise on taste after tasting the soymilk sample, despite health benefits being presented to them. This is inconsistent with Kahkonen, Tuorila, and Rita (1996) who found that a low-fat spread was better accepted if consumers received nutrition information before using it. Our results therefore do not support the earlier assumption (stated in the aim) that perceived health benefits would increase consumers' willingness to compromise on taste for health.

Since no association was found between age and willingness to compromise on taste for health (in case of soymilk product) and the same was true for gender, one can disagree with Werbeke statement from 2001 "Consumers who are ready to accept immediate and noticeable worse taste for potential future health benefits are mostly women and elderly." The only associations that could be found (on the above discussed willingness) revealed that subjects not willing to compromise on taste for health were mostly those who thought that soymilk tasted worse than dairy milk (n=34) as well as those who though soymilk had an aftertaste (n=24) and were undecided on soymilk's aftertaste

(n=25). That, however, only indicates that those who already preferred the taste of dairy milk would not trade it for soymilk. It also says that even though 25 subjects were not sure whether soymilk had an aftertaste, they still would not trade it for its conventional substitute. That perhaps suggests that aftertaste is not the major determinant in compromising on taste for health in the case of soymilk and that taste of soymilk itself is the most important determinant.

Even in the focus group discussion, when participants were asked "would the health benefits outweigh your negative taste perceptions?"(after tasting the soymilk sample), none of them mentioned aftertaste in their responses, most were only concerned with taste:

" I just can't get pass that 'vegetabley' taste… (female, 23)

"…I just couldn't get used to this taste. Why torture my taste buds if I don't have to?" (male,45)

"This taste just brought bad memories back, of a soymilk and my ex! No way would I trade it for a dairy milk. (male,22)

"I would still only have it with my cereals. Then you can ignore the grainy taste. (female,26).

This indicates that even health-orientation does not influence acceptance or liking of a soymilk product when the taste is found unacceptable and therefore is not the driver or motivation for being willing to compromise on taste. This conclusion is supported by research reported by several authors who have reported that consumers are hardly willing to compromise on the taste of functional foods for eventual health benefits,

being taste expectations a critical factor when selecting functional foods (Ares, Giménez, & Gámbaro, 2008; Poulsen, 1999; Tuorila & Cardello, 2002; Verbeke, 2006).

In conclusion, there is evidence that taste and enjoyment of foods are strong determinants of food choices by our sample of consumers. Soya products may have an important role to play here, providing opportunities to consumers to enhance the healthiness of their diet while not requiring large-scale changes that compromise the pleasure from food. Soya (without considering the soya protein cholesterol lowering effect) fits in well with current dietary guidelines, which can therefore play a valuable role in helping to manage cholesterol levels in the UK population.

Generally the impact of soya protein inclusion in the diet is to reduce saturated fat intake. This in itself can reduce blood cholesterol and together with the specific effect of soya protein on cholesterol the overall impact on the UK population is likely to be beneficial and has the potential to significantly reduce heart disease and the current £3.3billion NHS bill (Department of Health, 2011).

Nonetheless, such enhancement of the value of soy products owing to the health promoting attributes is not going to be materialized for majority of the consumers in the UK unless improvements in the taste of soy food is accompanied. In terms of soya market development it has been estimated that the UK is 2-4 years behind the US. (Harland, 2002)

Therefore, it is crucial that the industry involved with functional foods need to work harder in order to present functional food product solutions that are much more

appealing in taste, texture and appearance, rather than 'hope' that the mass consumer market would so easily compromise. Thus, it is important to develop novel soya products or a range of new food formulations through innovative technology such as high hydrostatic pressure as suggested by Jooyandeh (2011), since gently heat-treated products produce strong off-flavors, which is the main problem for developing soy protein foods (Jooyandeh, 2011).

Alternatively, it can be argued that functional foods should be designed for niche markets, rather than being developed for the whole marketplace as argued by Ares & Gámbaro (2007), because consumers seek healthy foods for a variety of reasons and have different preference patterns. Furthermore, Stein & Rodríguez-Cerezo (2008) add that not all functional foods are functional for the entire population: some may only produce beneficial effects in individuals with specific risk factors or for intakes beyond a certain threshold.

Therefore, functional products could be designed for and targeted at consumers with specific health conditions, i.e. heart disease and related conditions, for those with deficiencies in their diets or those with food intolerances, such as lactose intolerance. They would be chosen in preference to taking pills or medication if those specific consumers committed to their benefits are willing to suffer some unpleasant taste in order to achieve the desired health benefit. Perhaps those motivated consumers can translate an assumed health benefit into better liking for a new product as suggested by Kahkonen et al. (1996), while the rest of the general public might benefit from a better education and information on functional foods to potentially opt for alternative choices.

4.8 Study Limitations.

A limitation to this study, however, is the fact that this study dealt with consumer willingness to compromise on the taste of soymilk as a specific functional food product. A conclusion from this research cannot apply to all functional foods; some products may have such a strong health claim that consumers are still ready to compromise on taste as indicated by Urala and Lähteenmäki in 2004. In this respect, a conclusion cannot be made about consumers' willingness to compromise on taste for health in case of functional products as an abstract product category.

Another limitation of the present work is the fact that the same consumers participated in both methodologies, which might have affected the results. This issue needs to be addressed in future studies. In addition, the sampling approach employed and the sample size does not ensure a representative sample of the adult population from a demographic perspective and the results are therefore not projectable to a population. Furthermore, a non responsive bias might exist to the extent that those participating in the survey may hold different views to those who decide not to participate.

Another flaw in the study was the small sample size of the focus group, therefore, results are not projectable to a population. Although an attempt was made to screen for participants that represent the target market, the small sample size does not allow the target market to be represented. In addition, topics and direction of the discussion were

moderator dependent, thus moderator bias might have easily occurred. There is no way of knowing if all the interviewees' true feelings were given and there is also a risk that subjects were bias in their responses in order to conform to peers in the focus group. Furthermore, searching through written responses and relying on the researchers own judgment as to what the consumers really meant in their answer might have resulted in inaccurate interpretation.

Notwithstanding the methodological limitations, focus group studies have been proven to be valuable and were successful in exploring consumer perceptions in the domain of food-related behaviour (Barrios, Bayarri, Carbonell, Izquierdo, Costell, 2008).

4.9 Recommendations for Further Research:

*In this study, a majority of people questioned were from the Merseyside, who may not be representative of the nation as a whole. An expansion of this research to a national scale could provide more interesting data, on attitudes, tastes and buying habits of functional foods.

*Similar research using sensory testing methods can be done across a whole range of soy products, not including soy milk.

*Another possibility is to conduct a research purely based on focus groups: some with consumers who use soy-containing products (perhaps at least once a month) and the other with nonusers in order to understand their attitudes concerning soy products.

CHAPTER 5: Conclusions

This study employed a multi-functional approach taking into account the influences on food choice using and integrating the "voice of the consumer". The results obtained by this approach tell us that the consumers (mostly in the Merseyside) are rather sceptical towards the concept of functional foods in general (especially about providing a proven health benefit), their knowledge is uneven and limited. They also view functional foods as an expensive and unnecessary addition to their diet.

As far as soy products are concerned, consumers appear uninformed rather than sceptical. The only health property of soy that 54% of subjects recognised was its ability to reduce the risk of heart disease. That knowledge was much higher amongst females both in the survey and in the focus group. Soy products were mostly disliked, reasons very much attributed to the taste. This research showed that consumers seem keener on soy products in general than in soymilk, which is reflected in their purchasing behaviour. Since soy products were seen as bland and flavourless or strong and unpleasant by the focus group, one can say that they did not find the soymilk desirably palatable. This could help explain the low overall acceptability of soymilk by the survey participants (more by males than females), where a majority (60%) disliked the sample slightly, moderately, very much and extremely and the fact that when soymilk is bought, it's mostly to be used in coffee or cereals for it to be acceptably palatable.

One of the more obvious results of the study is the fact that the actual liking of soymilk based on tasting as opposed to perceived liking/disliking, considerably affected consumer preference for the product. That may have resulted in their negative decision on the likelihood of willingness to compromise on taste of it for health benefits offered. Furthermore, it appears from the findings that greater knowledge on soy health benefits does not guarantee greater acceptance, it does however guarantee higher purchasing behaviour; respondents who believed in health benefits of soy were willing to purchase them more often. This finding is consistent with research reported by Mackenzie Moon et al. (2005) who showed that consumers' perceived health benefits of soy foods significantly increased the frequency of consuming soy foods. Wansink & Chan (2001) also concluded that nutritional knowledge of functional foods was associated with soy consumption.

However, although consumers might have reported higher purchasing due to their increased knowledge on soy benefits, when the taste was found unacceptable, 79% of consumers refused to compromise on taste for health, hence, the consumer's view of the importance of the health benefit does not lead to the acceptance of an inferior taste in order to achieve a health benefit. Those empirical findings invariably prove that acceptance of soymilk and soy products is unconditional and that taste emerges as an extremely critical factor for the acceptance of soymilk.

CHAPTER 6: References

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Appendix 1 : Questionnaire

University of Chester

Questionnaire

Date: ….. Interview number:…

Demographic information :

1) Age: □18-25 □26-35 □36-45 □46-55 □56-65 66-75 □75+
2) State of health: Excellent □ Good □ Moderate □ Weak□
3) Gender : Male □ Female □
4) Family status: Single without child/children □ Married without child/children □
Single with child/children □ Married with child/children □

Nutritional knowledge and consumption of soy products

5) Are you familiar with the term "functional foods?" Yes □ No □ Not sure □
6) Do you consider soy to be a "functional food"? Yes □ No □ Not sure □
7) Do you like products with soy? Yes □ No □ Not sure □
8) Would buy soy based products because of?
Taste/Flavour □ Price □ Packaging □ Nutritional value □
9) Do you consider soy to be healthy? Yes □ No □ Not sure□
10) Do you consider soy to be low in fat? Yes □ No □ Not sure □
11) Do you consider soy to have a low glycaemic index? Yes □ No □ Not sure □
12) Do you consider soy to be high in fibre? Yes □ No □ Not sure□
13) Do you consider soy to be low in cholesterol? Yes □ No □ Not sure□
14) Do you consider soy to have cholesterol lowering effect? Yes □ No □ Not sure□
15) Do you consider soy can reduce the risk of heart disease? Yes □ No □ Not sure □
16) Do you consider soy decreases osteoporosis? Yes □ No □ Not sure □
17) Do you consider soy helps increase bone density? Yes □ No □ Not sure □
18) Do you consider soy helps reduce the risk of prostate and breast cancer?
Yes □ No □ Not sure □
19) Would you buy more soy products if you knew of its specific associated benefits?
Yes □ No □ Not sure □
20) Do you consider soy to be a complete protein? Yes □ No □ Not sure □
21) Do you consider soy to be easy to cook? Yes □ No □ Not sure □
22) Do you consider soy can prevent chronic nose bleeds? Yes □ No □ Not sure □
23) Do you consider soy to reduce risk of autoimmune diseases? Yes □ No □ Not sure □
24) Do you consider soy allergies to soy foods to be common? Yes □ No □ Not sure □
25) Do you look for health benefit claims on food packaging? Yes □ No □ Not sure □

Soy consumption intentions and Likelihood of buying soy products

26) Do you buy soy products:

□ 1-2 times per week
□ 3-4 times per week
□ 5-6 times per week
□ 2-3 times per month
□ 1 time per month or less
□ Never

27) Do you buy soy milk:

□ 1-2 times per week
□ 3-4 times per week
□ 5-6 times per week
□ 2-3 times per month
□ 1 time per month or less
□ Never

28) What is your purpose of buying soy milk?

Use in cooking □ Use in baking □ Have with breakfast cereals □
Use in tea/coffee □ To drink □ Don't buy soymilk □

29) Do you like the taste of soy products? Yes □ No □ Not sure □
30) Do you like the taste of soy milk? Yes □ No □ Not sure □
31) Do you think that soy milk has an aftertaste? Yes □ No □ Not sure □
32) Do you think that soy milk tastes worse than dairy milk? Yes □ No □ Not sure □

33) If soy milk product is healthy/(ier than conventional dairy product), would you:
- □ Definitely buy it
- □ Probably buy it
- □ Maybe buy it
- □ Probably not buy it
- □ Definitely not buy it

34) If soy product was healthy but you didn't like the taste of it, would you:
- □ Definitely buy it
- □ Probably buy it
- □ Maybe buy it
- □ Probably not buy it
- □ Definitely not buy it

35) What are your reasons for buying soy milk products?
Healthiness □ Taste □ Security and familiarity □ Convenience and Price □

36) What are your reasons for buying dairy products?
Healthiness □ Taste □ Security and familiarity □ Convenience and Price □

37) Would you accept soy milk product even if it tastes worse than conventional substitute if it offers some health benefits? Yes □ No □ Not sure □

Soy milk Acceptability:

Indicate how much you liked or disliked the soy milk you just tasted:

	Liking								
Overall acceptability:	□	□	□	□	□	□	□	□	□
	Dislike extremely				Neither like nor dislike				Like extremely

Comments:…….
……

Thank you for taking time to fill out this questionnaire. If you would like any more information about this study and/or would like to participate in a focus group to discuss more about your choice of purchasing, preference and acceptance of soy products, ask the researcher for more details on how to get involved.

I would like to take part in a focus group: Yes □ No□

Appendix 2 : Consent form for Method 1

Consent Form

Title of Project: Consumers' willingness to compromise on taste for health, with reference to soymilk.

Name of Researcher: Alena Kusnierikova

Please initial box

1. I agree to take part in the survey by filling the questionnaire and taste a soymilk sample ☐

2. I confirm that I have no known food / soy allergy. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Appendix 3 : Consent form for Method 2

Consent Form

Title of Project: Consumers' willingness to compromise on taste for health, with reference to soymilk.

Name of Researcher: Alena Kusnierikova

Please initial box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and without my legal rights being affected. ☐
3. I agree to take part in the above study. ☐
4. I confirm that I have no known food / soy allergy. ☐
5. I agree for the Focus Group session to be audio recorded. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Appendix 4 - Participant information sheet for method 2

Participant information sheet

Consumers' willingness to compromise on taste for health, with reference to soymilk.

You are being invited to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

What is the purpose of the study?
You are being invited to participate in a research study of Consumers' willingness to compromise on taste for health, with reference to soymilk. The study aims to address consumer acceptance of soymilk products. It also aims to investigate whether health-orientation, is the driver or motivation for being willing to compromise on taste with reference to soymilk.
This study will recruit approximately 6-8 subjects from Merseyside area over a period of 1-2 months.

Why have I been chosen?
You were selected as a possible subject in this study because you fit certain criteria, so your answers represent a large segment of the population as you are from Merseyside or surrounding areas, which is generally characterised as an area with a culturally diverse population. You were also selected on the basis of your good health conditions, time availability, no allergy to soy or any aversion to soy products and your willingness to participate.

Do I have to take part?
It is up to you to decide whether or not to take part. If you decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect you in any way.

What will happen to me if I take part?

If you agree to take part in this study, your consent will give for the researcher to contact you to participate in a focus group session. In this one focus group (lasting approximately 90-minutes) you will be asked general questions about your choice of purchasing, preference and acceptance of soymilk products. Towards the end of the session, you will be asked to taste a soymilk sample. The session will be audio taped and a transcript which will not include any personal identification will then be created.

What are the possible disadvantages and risks of taking part?
There are no disadvantages or risks foreseen in taking part in the study.

What are the possible benefits of taking part?
There is no direct benefit to you from being in the study. However, your participation may contribute to the knowledge about the soy products

What if something goes wrong?
If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, please contact Professor Sarah Andrew, Dean of the Faculty of Applied Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ, 01244 513055.

Will my taking part in the study be kept confidential?
All information which is collected about you during the course of the research will be kept strictly confidential so that only the researcher carrying out the research will have access to such information. In the event of any publication regarding this study, your identity will remain confidential.

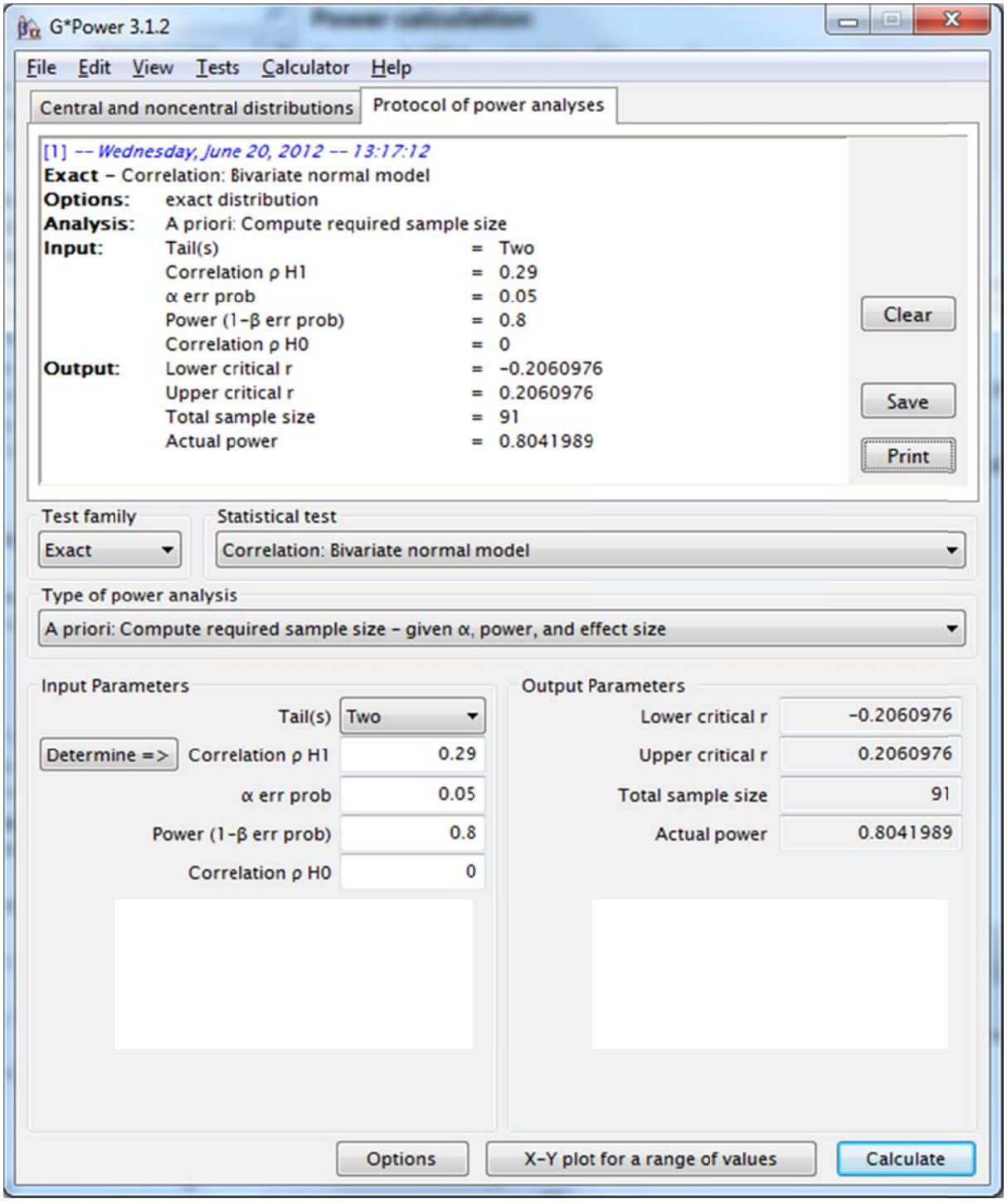
What will happen to the results of the research study?
The results will be written up into a dissertation for my final project of my MSc. Individuals who participate will not be identified in any subsequent report or publication.

Who is organising the research?
The research is conducted as part of a MSc in Public Health Nutrition within the Department of Clinical Sciences at the University of Chester. The study is organised with supervision from the department, by Alena Kusnierikova, a MSc student.

Who may I contact for further information?
If you would like more information about the research before you decide whether or not you would be willing to take part, please contact:
Alena Kusnierikova,

Thank you for your interest in this research.

Appendix 5 : G*power calculation output



Appendix 6 : Advertising material – recruitment poster

University of Chester

HAVE YOU G
PARTICIPAT

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oya
be
milk

Contact person: Alena

Ask at the bar for further information.

Appendix 7: Approval letter from Ethics Committee

Faculty of Applied Sciences
Research Ethics Committee

Tel 01244 511740
Fax 01244 511302
frec@chester.ac.uk

Alena Kusnierikova
University of Chester
Parkgate Road
Chester
CH1 4BJ

13th September 2012

Dear Alena,

Study title: **Consumers' willingness to compromise on taste for health, with reference to soymilk.**
FREC reference: **689/12/AK/CS**
Version number: **2**

Thank you for sending your application to the Faculty of Applied Sciences Research Ethics Committee for review.

I am pleased to confirm ethical approval for the above research, provided that you comply with the conditions set out in the attached document, and adhere to the processes described in your application form and supporting documentation.

The Committee would like to make the following recommendation:-

- On the Participant Information Sheet, consider giving guidance on the location and duration of the Focus Group.

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Application Form	1	May 2012
Appendix 1 – List of References	1	May 2012
Appendix 2 – C.V. for Lead Researcher	1	May 2012

Appendix 3 – Participant Information Sheet	1	May 2012
Appendix 4 – Participant Consent Form	1	May 2012
Appendix 5 – Questionnaire	1	May 2012
Appendix 6 – Email permission – The Brink, Liverpool	1	May 2012
Response to FREC request for further information and clarification		June 2012
Application Form	2	June 2012
Appendix 1 – List of References	2	June 2012
Appendix 2 – C.V. for Lead Researcher	2	June 2012
Appendix 3 – Participant Consent Form (Method 1)	2	June 2012
Appendix 4 – Participant Consent Form (Method 2)	2	June 2012
Appendix 5 – Participant Information Sheet (Method 2)	2	June 2012
Appendix 6 – Written permission to use facilities – The Brink Café, Liverpool	1	June 2012
Appendix 7 - Questionnaire	2	June 2012
Appendix 8 – Recruitment Poster	1	June 2012
Appendix 9 – Soya factsheet and references	1	June 2012
Appendix 10 – Time Plan	1	June 2012
Appendix 11 – G*power calculation output	1	June 2012
Response to FREC request for further information and clarification		August 2012
Appendix 1 - Questionnaire	3	August 2012
Appendix 2 – Participant Information Sheet (Method 2)	3	August 2012
Appendix 3 – Revised recruitment process information and poster	2	August 2012
Response to FREC request for further information and clarification		September 2012
Appendix 1 - Questionnaire	4	September 2012
Appendix 2 – Participant Information Sheet (Method 2)	4	September 2012
Appendix 3 – Participant Consent Form (Method 1)	4	September 2012
Appendix 4 – Participant Consent Form (Method 2)	4	September 2012
Appendix 5 – G*power calculation output	2	September 2012
Appendix 6 – Advertising material – recruitment poster	3	September 2012

With the Committee's best wishes for the success of this project.

Yours sincerely,

Dr. Stephen Fallows
Chair, Faculty Research Ethics Committee

Enclosures: Standard conditions of approval.
C.c. Supervisor FREC Representative

Appendix 8: Focus Group Questions and Discussion Probes

Table 1. Focus Group Questions and Discussion Probes

Questions/Topics	Selected Discussion Prompts
Beliefs about functional foods Beliefs about soy foods	What comes to mind when I first say the phrase "functional food"? Are functional foods healthy and, if so, why? What comes to mind when I first say the word "soy"? Are soy foods healthy and, if so, why? Are soy foods unique, or are they the same as other foods? What is there positive/negative about soy?
Knowledge of soy market and perceived health benefits of soy.	Could you give some examples of soy foods? What are the health benefits of soy foods?
Perceived barriers of consuming soy.	If you don't eat soy, or know someone who doesn't, what are some barriers to its consumption? How do soy foods compare in taste with others foods? How do soy foods compare in price with others foods? What is the likelihood that you will buy soy foods in the future? Why not?
Perceived promoters of consuming soy.	What health reasons might a person give for consuming soy? Why might a vegetarian eat soy? How can we persuade people who do not use soy in a regular manner to begin so? How might someone learn more about soy? What are reliable sources of information?
Taste of soy and willingness to compromise on taste for health.	Did you like the soymilk sample given? Why? Why not? How would you describe the taste, colour, texture and appearance of it? If you didn't like the taste of soy product, would you consume it anyway knowing its health benefits? Why not?

Appendix 9 - Written permission to use facilities

PJ Smith
Client Engagement
The Brink Cafe Ltd
5-21 Parr Street
Liverpool
L1 4JN
Tel. 07527 131636

Dear Alena Kusnierikova,

Following our recent conversation and email correspondence regarding your research proposal, I am happy to give my consent to you to approach customers in our bar. This will be for the purpose of being members in your focus group and completing questionnaires.

You can also use our conference room for holding your focus group session.

Yours sincerely,

PJ Smith

15-21
PARR ST
LIVERPOOL. L1 4JN
TEL: 0151 703 0582
INFO@THEBRINKLIVERPOOL.COM
WWW.THEBRINKLIVERPOOL.COM
THE BRINK CAFÉ LTD
HEAD OFFICE, EAST KNOYLE,
SALISBURY, WILTSHIRE, SP3 6BE
REGISTERED IN ENGLAND AND WALES
REG. No. 07533303
VAT No. 109687091

Appendix 10: Permission by email

From: PJ Smith
Sent: 03 May 2012 09:58
To: ALENA KUSNIERIKOVA
Subject: RE: research

Alena,

Just a quick email to let you know that it will be ok for you to go ahead with this at The Brink.

Thanks

PJ

From: ALENA KUSNIERIKOVA
Sent: 26 April 2012 12:54
To: PJ Smith
Subject: research

Dear Mr Smith,

I am currently pursuing a Masters Degree in Public Health Nutrition at
the University of Chester and am presently developing a research proposal for my postgraduate dissertation titled "Consumers' willingness to compromise on taste for health, with reference to soymilk".
I am requesting your permission to ask your customers to participate in my study by completing a short questionnaire and taste a soymilk sample. I would also like to use your conference room facility to conduct one focus group session, lasting approximately an hour. I would be grateful for the use of a small space within your fridge to store the samples.

Please find attached a copy of the questionnaire that I plan to use for my research.

Thank you very much in anticipation of your favourable action.

Alena Kusnierikova

Appendix 11 : Soya fact sheet